THE EVOLUTION OF AI: LEGAL NEXUS WITH INTERNATIONAL TRADE AND INDIAN COPYRIGHT REGIME

Dissertation submitted to the National University of Advanced Legal Studies, Kochi in partial fulfilment of the requirements for the award of LL.M. Degree in International Trade Law

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CERTIFICATE

This is to certify that **Mr. NEVIN KOSHY JOHN, Reg. No. LM 0224017** has submitted his Dissertation titled " **THE EVOLUTION OF AI: LEGAL NEXUS WITH INTERNATIONAL TRADE AND INDIAN COPYRIGHT REGIME**", in partial fulfilment of the requirement for the award of Degree of Master of Laws in International Trade Law to the National University of Advanced Legal Studies, Kochi under my guidance and supervision. It is also affirmed that the Dissertation submitted by him is original, bona-fide and genuine.

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DECLARATION

I declare that this dissertation titled, " **THE EVOLUTION OF AI: LEGAL NEXUS WITH INTERNATIONAL TRADE AND INDIAN COPYRIGHT REGIME** ", researched and submitted by me to the National University of Advanced Legal Studies, Kochi in partial fulfilment of the requirement for the award of Degree of Master of Laws in International Trade Law, under the guidance and supervision of **Dr. ATHIRA P.S** is an original, bona-fide and legitimate work and it has been pursued for an academic interest. This work or any type thereof has not been submitted by me or anyone else for the award of another degree of either this University or any other University.

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PREFACE

This dissertation “The Evolution of AI: Legal Nexus with International Trade and Intellectual Property Rights” is made in partial fulfilment of the requirement for the award of Degree of Master of Laws in International Trade Law to the National University of Advanced Legal Studies, Kochi.

This dissertation delves into the profound legal implications arising from this transformative technology, specifically focusing on its intricate relationship with international trade and intellectual property law. The central purpose of this dissertation is to thoroughly outline the development of AI, specifically its advancement to deep learning and generative ability, and critically examine the ensuing legal issues in the contexts of international trade and intellectual property rights. Focusing primarily on the law of copyright, I explore the particular shortcomings of the Indian juridical framework and draw comparative insights from other jurisdictions.

My study strives to respond to fundamental questions about the influence of AI on the business of copyrights and global trade, the extreme challenges that ideas such as 'fair use' and 'algorithmic collusion' pose to conventional copyright customs, and whether India's existing copyright system adequately addresses such intricate matters. Ultimately, this paper aims to suggest tangible legal reforms and policy suggestions to fill the gaps and create a balanced environment that promotes AI innovation while strongly protecting creators' rights and enabling fair global trade.

I hope that the observations and suggestions made in this article will add to the global discussion on AI governance and be a useful reference for policymakers, legal practitioners, and scholars working towards finding an effective path to traverse the challenging legal terrain of the AI age.

LIST OF ABBREVIATIONS

A.I.	ARTIFICIAL INTELLIGENCE
AI ACT	ARTIFICIAL INTELLIGENCE ACT 2024
AGI	ARTIFICIAL GENERAL INTELLIGENCE
AIR	ALL INDIA REPORTER
ALR	AMERICAN LAW REPORTS
API	APPLICATION PROGRAMMING INTERFACES
BCE	BEFORE COMMON ERA
CPTPP	COMPREHENSIVE AND PROGRESSIVE AGREEMENT FOR TRANS-PACIFIC PARTNERSHIP
DABUS	DEVICE FOR THE AUTONOMOUS BOOTSTRAPPING OF UNIFIED SENTIENCE
EDVAC	ELECTRONIC DISCRETE VARIABLE AUTOMATIC COMPUTER
ENIAC	ELECTRONIC NUMERICAL INTEGRATOR AND COMPUTER
E. U	EUROPEAN UNION
EC	EUROPEAN COMMISSION
GATT	GENERAL AGREEMENT ON TARIFFS AND TRADE
GDPR	GENERAL DATA PROTECTION REGULATION
GI	GEOGRAPHICAL INDICATION
GPAI	GENERAL PURPOSE ARTIFICIAL INTELLIGENCE
GPU	GRAPHICS PROCESSING UNITS
GPT	GENERATIVE PRE-TRAINED TRANSFORMER
IEC	INTERNATIONAL ELECTROTECHNICAL COMMITTEE
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
IP	INTELLECTUAL PROPERTY
IPR	INTELLECTUAL PROPERTY RIGHTS
IT	INFORMATION TECHNOLOGY

ITU	INTERNATIONAL TELECOMMUNICATION UNION
LLMs	LARGE LANGUAGE MODELS
ML	MACHINE LEARNING
NLP	NATURAL LANGUAGE PROCESSING
OECD	ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
ReLU	RECTIFIED LINEAR UNITS
TDM	TEXT AND DATA MINING
TRIPS	TRADE – RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS
UK	UNITED KINGDOM
UKIPO	UNITED KINGDOM INTELLECTUAL PROPERTY OFFICE
UN	UNITED NATIONS
UNCTAD	UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
US	UNITED STATES
USMCA	UNITED STATES MEXICO CANADA AGREEMENT
WTO	WORLD TRADE ORGANISATION

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CHAPTER 1

INTRODUCTION

"Success in creating AI could be the biggest event in the history of our civilization, But it could also be the last – unless we learn how to avoid the risks."

~Stephen Hawking

1.1 AI, INTERNATIONAL TRADE & IPR IN THE CHANGING WORLD

In the twenty-first century, Artificial Intelligence (AI) has emerged as one of the most transformative forces in technology, business, and society. It encompasses a wide range of capabilities, from machine learning and natural language processing to autonomous decision-making enabling systems to perform tasks traditionally requiring human intelligence. We have reached a point wherein artificial intelligence has already been a significant part of our daily routine, moreover we have evolved from AI being hot news to AI being the new normal. As AI continues to evolve, it increasingly permeates core sectors of the global economy, including manufacturing, healthcare, finance, and international trade.

Geoffery Hinton, who is seen as the Godfather of Artificial Intelligence has done pioneering research on neural networks and deep learning has paved the way for current AI systems like ChatGPT. In artificial intelligence, neural networks are systems that learn and process information similarly to the human brain. These neural networks facilitate AIs to learn from their experiences much like humans do and we commonly refer to this as deep learning. In an interview given to BBC, Hinton remarked that currently, they are not more intelligent than us, but he thinks that AI will soon outrun humans. He also pointed out that some of the dangers of AI chatbots were "quite scary"[1].

[1] Georgina Rannard, 'Godfather of AI' shares Nobel Physics Prize (8th October 2024) https://www.bbc.com/news/articles/c62r02z75jyo

The fundamental idea behind artificial intelligence can always be closely associated with the concept of automation and it did make our lives much simpler, from monitoring one's health to doing household chores, application of artificial intelligence is all around us.[2] The generative capacities possessed by an AI enables it to have a continuous evolving one. This raises various concerns about data privacy, surveillance, generation of creative work etc. In recent years, artificial intelligence (AI) has emerged as a major force for transformation across a range of industries, including the creative sector. The application of artificial intelligence techniques in fields including literature, film, music, and visual arts has attracted a lot of interest and discussion and at this juncture AI comes in conflict with the present-day legal regimes.[3]

As technology advances, artificial intelligence (AI) poses previously unheard-of difficulties for established legal frameworks, especially in the areas of international trade law and intellectual property rights (IPR). Legal frameworks have historically been predicated on the idea that human agency is the source of creativity, authorship, and innovation. The emergence of AI-generated content, whether it be software, literature, art, or music, poses important issues regarding ownership, authorship, and the validity of current copyright regulations.[4]

Additionally, AI is having a bigger impact on how international trade is shaped, from AI-driven logistics and data analytics in global supply chains to automated decision-making in e-commerce. But the speed at which technology is developing has surpassed the development of legal standards, creating gaps in international harmonization, governance, and enforcement. Ownership of algorithmic outputs, the legal standing of AI-generated content, and how these advances are treated under international trade frameworks like the WTO or TRIPS Agreement are still hotly debated and not sufficiently addressed.

This dissertation attempts to investigate the changing legal link among AI, global trade, and intellectual property rights, with a focus on copyright law and the Indian legal system.

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[2] Janna Anderson & Lee Rainie, Artificial Intelligence and the Future of Humans, Pew Research Centre (10th December 2018). https://www.pewresearch.org/internet/2018/12/10/artificial-intelligence-and-the-future-of-humans/

[3] V K Ahuja, Artificial Intelligence and Copyright: Issues and Challenges, ILI Law Review (2020).

[4] *Id.*

1.2 LITERATURE REVIEW

AI is enigmatic in its clear meaning, but in today's world, it universally pertains to machines that can go beyond their explicit programming by making decisions that reflect human cognition (Smith, McGuire et al., 2023). The reliance on AI is greater than what people are aware of (Cath, 2018). As increasingly complex software becomes part of AI, its influence is growing exponentially (Chollet, 2017). AI has progressed from simple calculation to the creation of poetry, painting, and other more complicated creative works (Thaler, 2013). Al developers have made quantum advances in the generative creation of art and other expressive media, many of which came to fruition with consumer-ready applications in 2022 (Bourne, 2023).

The legal landscape surrounding AI and copyright is characterized by a lag in legislation compared to technological advancement (Ali, 2023). The U.S. Copyright Office maintains a stance that copyright protection is confined to original intellectual conceptions of a human author, explicitly rejecting works created solely by machines or mere mechanical processes operating randomly or automatically without human creative input (Hristov, 2017). Courts have historically adopted a broad interpretation of "authorship," often linking it to causation, where the human operator is deemed the "originator" or "cause of the picture," even when a machine is involved. However, the notion of "mechanical" or "routine" production is implicitly placed beyond copyright protection (Bridy, 2012). The European Union generally aligns with the human author requirement, with rulings suggesting that only human creations are protected and "modicum of creativity" standard, adopted in India, requires some substantive variation in the work to be copyrightable. (Mishra & Singh, 2024).

Fair use today does not look entirely like it has in the past (Burke, 2019). The use of fair use in AI is complex as conventional AI tools tend to apply copyrighted information for non-expressive functions (such as analysing facial structure in images), generative AI seeks to learn and replicate the copyrightable elements of works from its training data, presenting a possible conflict, this is important because when the goal of the AI is expressive and identical to the purpose of the original work, the case for fair use

becomes weaker (Alhadeff, 2024). Generative AI tends to take in entire works in order to learn the patterns and produce human-like content, citing fair use (Spica, 2024)

The widespread use of copyrighted content to train AI algorithms raises the degree of "algorithmic collusion," in which AI applications, unintentionally, repeat copyrighted content or styles. While AI engineers claim that their programs are programmed not to reproduce unique images from training sets but to learn from them and create new outputs, examples of AI-generated contents showing significant similarity, such as watermarks or creator signatures, raise valid IP issues. This is exacerbated by the capacity of AI to mimic certain artistic styles, such that AI-provided works are often inseparable from a human creator's work, causing dilution of the original market for unique creations (Murray, 2023)

The increasing prominence of AI in creative domains necessitates a re-evaluation of copyright law to balance incentives for innovation with the protection of creators' rights, particularly as the lines between human and artificial creativity continue to blur (Bridy, 2012).

1.3 STATEMENT OF PROBLEM

Despite the significant ease AI brings into our life, it has serious concerns at various levels that need to be addressed without much delay. AI has crossed paths in almost each and every aspect of our daily routine and this points to the intersection of AI with the current legal regime, out of which concerns are significantly higher among intellectual property right norms. Today, artificial intelligence, especially generative AI have been actively causing various copyright violations and these infringements or violations are done under the shadow of the exceptions provided by the copyright law. As the concerns relating to generative AI are increasing gradually, there is a need for a strengthened legal regime so as to prevent the rights of the copyright holder from being violated and also to uphold the core values behind the concept of intellectual property rights.

1.4 SCOPE OF STUDY

The legal implications of AI are no longer a speculative concern, they demand urgent attention from lawmakers, jurists, scholars, and international organizations. Therefore, this study focuses primarily on the interaction between AI and IPR in relation to the trade, i.e. to bridge the gap between AI innovation and the rigidity of traditional legal frameworks. IPR is indeed a broader field which encompasses patent and trademark, GI etc but our study will have primarily emphasis on the copyright regime as it is more closely related because of its creative and content – generating capabilities of AI. The generative capabilities of AI coupled with proper algorithms contribute to extensive copyright violations and these instances will also be looked into through the study. The analysis will mainly revolve around the Indian legal system, while comparative perspectives from the United States, the European Union and other relevant international treaties will also be looked into. The research is doctrinal and theoretical in nature, and does not involve empirical or quantitative data collection.

1.5 RESEARCH QUESTIONS

(i) How has the evolution of artificial intelligence to deep learning systems impacted the copyright industry as well as international trade?

(ii) How does the challenges of 'fair use' and 'algorithmic collusion' posed by AI affect the traditional copyright norms?

(iii) Whether India's current copyright regime is adequate for addressing the challenges posed by Generative AI?

(iv) How can the present legal gaps be rectified through legal reforms or policy recommendations that will enable to strike a balance between AI innovation and the intellectual property regime.

1.6 RESEARCH OBJECTIVES

(i) To trace out the evolution of AI and understand the purpose behind its creation and its impact on the copyright industry.

(ii) To analyse the existing legal framework of various countries, especially India and its effectiveness in governing AI related aspects.

(iii) To understand how AI and its intersection with the IPR regime has been addressed internationally and its impact on international trade is taken into account.

(iv) To understand the concept of fair use and algorithmic collusion and to show how generative AI shapes it.

(v) To understand the regulatory gaps that exist in the copyright regime, with special reference to India.

1.7 HYPOTHESIS

The evolution of AI has had implications on the copyright industry and the increased pace of development is concerning. The current international and domestic laws regarding intellectual property and international trade are inadequate to cover the intricate legal issues raised by the development of Artificial Intelligence, especially as far as authorship, ownership, and transboundary regulation of content generated by AI is concerned. The exception of 'fair use' has changed in the world of data driven generative AI. Algorithmic collusion, once a part of the competitive law regime, now extends to the intellectual property regime altering traditional copyright principles. While AI further merges human and machine imagination, a pressing need is created for evolving legal reform aligning national regulations with global norms so that an equal, innovation-accommodative, and rights respecting global legal system is formed.

1.8 RESEARCH METHODOLOGY

In the present study, the researcher is using Doctrinal or Non-Empirical legal research. The researcher has made an attempt to trace out the evolution of AI into generative AI and its rising concerns. The same is followed by the analysis of existing laws and regulations in India as well as the internationally available ones. For this purpose, the researcher has gone through various primary and secondary data sources.

The primary sources relied upon for this purpose include the regulations and laws in different countries and in India. The secondary sources include books, scholarly articles, research papers, recognized reports and journals on AI, IPR infringement and algorithmic collusion.

1.9 LIMITATIONS OF THE STUDY

The following are the limitations of the study:

(i) The concept of algorithmic collusion is a niche area and more technical facts is to be out yet.
(ii) The development of AI is at a tremendous pace, thereby making it difficult to understand the legal concerns in a time bound manner.

1.10 CHAPTERISATION

The dissertation will include a total of five chapters. The chapterisation is as of follows:

Chapter 1: Introduction

This chapter outlines the background of the study pinpointing the relevance of AI in the present-day world. It further covers the significance of the study, states the research questions and also the objectives the study seeks to achieve. It describes the methodology, and the detailed structure of the study.

Chapter 2: Tracing the Evolution of Artificial Intelligence to Generative AI

This chapter mainly examines the historical and technological development of AI and how it has crossed paths with two separate domains yet single, i.e. trade and intellectual property.

Chapter 3: Understanding the Legal Challenges with emphasis on the copyright laws of various nations.

A detailed study as to how AI causes various legal dilemmas, especially with regard to copyright regime and also looks into the regulatory gaps that exist in various legal systems.

Chapter 4: Fair Dealing and Addressing Algorithmic Collusion with Regard to Indian Copyright Regime.

This chapter mainly seeks to point out the concerns associated with the use of training data under the fair use exception and also sheds light by explaining the concept of algorithmic collusion and the danger it poses to the current Indian legal system.

Chapter 5: Conclusion and Recommendations

This chapter includes the summarized findings, the research questions and its answers, and will also provide for various recommendations for legal reform and future research.

CHAPTER 2

TRACING THE EVOLUTION OF ARTIFICIAL INTELLIGENCE TO GENERATIVE AI

AI will be the most transformative technology since electricity.

~ Eric Schmidt

2.1 INTRODUCTION

Once a fictional concept, slowly began to obtain scientific and philosophical inquiry and today we refer to it as 'artificial intelligence' or 'AI'. It has undergone dramatic transformation since its conceptual inception in the mid-20th century and has evolved into a powerful technological reality that now underpins key sectors of the global economy. The artificial intelligence (AI) concept has come a long way from mythological structures to sophisticated computational systems able to produce human-like content and carry out complex mental tasks. This chapter follows this evolutionary path while exploring how AI technologies have increasingly converged on two important areas of global governance: international trade and intellectual property rights (IPR). The intersection of these areas represents one of the greatest legal and policy challenges of our modern technological era, requiring careful examination of historical developments to inform future regulatory frameworks.[5]

The history of artificial intelligence is a demonstration of humanity's continued desire to comprehend and emulate human intelligence. From early philosophical questions regarding mechanical thought in ancient Greece to the mathematical foundations established in the mid-20th century, and lastly to current large language models and generative AI systems, each stage of development has increasingly extended capabilities and uses of AI technologies. This development has not been in a vacuum but has been closely interwoven with wider technological, economic, and social changes that have reshaped global systems of production, distribution, and creativity.[6]

[5] World Bank, Transformative technologies (AI) challenges and principles of regulation, Digital Regulation Platform, (08.05.2024)
[6] Klaus Schwab, The Fourth Industrial Revolution, World Economic Forum (2016).

As AI technologies have developed, they have become more deeply embedded in global trade systems, both as traded products and services in their own right and as drivers of cross-border commerce. AI systems now underpin trade logistics, supply chain management, market analysis, and trade negotiations, generating new efficiencies but also novel regulatory challenges. The borderless composition of AI technology confronts the conventional territorial notion of the regulation of trade, whereas AI-based automation upsets conventional patterns of comparative advantage and labour specialization that have traditionally supported international trade theory.[7] At the same time, the emergence of increasingly sophisticated AI has fundamentally disrupted conventional intellectual property regimes.[8] Patent systems, trade secret protections, and copyright law are all conceived ultimately for human inventors and human-invented creations, this confronts unparalleled questions about their relevance to works produced by machines and algorithmic creations. The conflict between safeguarding intellectual investment in AI research and providing adequate openness for ongoing innovation is a characteristic challenge for modern IPR systems.

This chapter explores these concurrent paths of evolution and the points at which they intersect, determining how the capabilities of AI technologies have increasingly moved into areas historically regulated by trade treaties and intellectual property conventions. Through examining the historical evolution of AI and its increasing integration with trade and IPR regimes, we can better understand the conceptual tensions and practical challenges that characterise the current regulatory landscape. The convergence of AI with commerce and intellectual property rights is not just a technical or legal novelty but is a foundational shift in how value is created, attributed, and traded in the global economy.[9] The process of understanding its development is key to resolving the multifaceted legal issues now facing policymakers, businesses, and creative communities worldwide.

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[7] Janos Ferencz, Javier López-González, et al., Artificial Intelligence and International Trade: Some Preliminary Implications, OECD Trade Policy Paper (2022).

[8] Rahul Kailas Bharati, AI and intellectual property: Legal frameworks and future directions, International Journal of Law, Justice and Jurisprudence (2024).

[9] Adil S. Al-Busaidi, Raghu Raman et al., Redefining boundaries in innovation and knowledge domains: Investigating the impact of generative artificial intelligence on copyright and intellectual property rights, Vol 9 Journal of Innovation and Knowledge (2024).

2.2 HISTORICAL DEVELOPMENT OF ARTIFICIAL INTELLIGENCE

2.2.1 Ancient Concepts and Philosophical Foundations.

The conceptual foundation behind artificial intelligence reaches further back into history than current computing technology. Ancient cultures worldwide experimented with the potential to make artificial creatures or mimic human mental processes through a variety of philosophical and mythological structures. The ancient history reveals humanity's long-standing fascination with creating entities that mirror human capabilities. In Greek mythology, Hephaestus, the god of artisanship, was credited with having made automatons - mechanical beings that could do things on their own. In the same way, the legend of Pygmalion is about a sculptor who fashioned a statue so realistic that it was ultimately given life.[10] Aside from mythology, Aristotle's syllogistic logic, which emerged in the 4th century BCE, created axiomatic bases for systematic thinking that would subsequently impact computational methods to problem-solving. His work in "Prior Analytics" established logical inference in terms of categorical syllogisms, a system of deductive reasoning that could be mechanized by rules, an idea that would later become pivotal to AI research.[11]

Parallel developments took place in the East Asia region, particularly in China. The mechanical engineering achievements during the Han Dynasty led to the creation of complex automata. There are instances of creation of mechanical devices that could make predictions and could perform calculations.[12] These early mechanical calculators pinpoint the efforts taken so as to automate human cognitive processes. Islamic intellectuals of the Medieval Ages made significant contributions to algorithmic reasoning and logical thinking. While Al-Jazari created sophisticated mechanical machines in the 12th century that could be programmed to carry out certain sequences of operations, Al-Khwarizmi's algebraic works from the 9th century introduced

[10] Ovid, Metamorphoses (A. D. Melville, Trans. Oxford University Press. 2004)
[11] Aristotle, Prior Analytics, Hackett Publishing Company, (Robin Smith, eds., 1989).
[12] Jospeh Needham & Ling Wang, Science and Civilisation in China: Volume 2, History of Scientific Thought, (Cambridge University Press., 1956).

systematic approaches to problem-solving.[13] Despite these developments being more mechanical than computational, it did pave the way to modern algorithmic thinking.

European philosophers in the 17th and 18th centuries further advanced the conceptual foundations for AI.[14] Thomas Hobbes suggested in "Leviathan" (1651) that reasoning was analogous to numerical computation, "nothing but reckoning."[15] Gottfried Wilhelm Leibniz developed a universal calculus for reasoning, envisioning a machine that could determine the truth value of statements—an early conception of automated reasoning[16] and referred to it as "calculus ratiocinator".[17]The development of Boolean Algebra in the mid 19th century provided a mathematical system for encoding logical operations[18], which later on became fundamental in designing digital circuits and computers establishing a direct link between philosophical and computational machinery.

These philosophical underpinnings created fundamental conceptual paradigms that would become fundamental to AI development: the idea that reasoning could be formalized into rules, that such rules could in principle be implemented by mechanisms, and that human thinking processes could, in principle, be simulated by systematic methods.[19]

2.2.2 Early Computational Theories

The recent history of AI research started in the mid-20th century with initial computational theories, advancing on mathematical ideas developed in earlier decades. In 1936, Alan Turing's foundational paper "On Computable Numbers" presented the Turing machine, an abstract device formalizing the idea of algorithmic computation. [20]

[13] David A King, The astronomy of the Mamluks: A brief overview, Muqarnas (1983).
[14] Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach (Pearson Education Inc., 2nd ed. 2003)
[15] Thomas Hobbes, Leviathan (1961)
[16] Pamela McCorduck, Machines Who Think (K. Peters Ltd., 2nd ed. 2004)
[17] Martin Davis, Engines of Logic: Mathematicians and the Origin of the Computer (W. W. Norton & Company., 2000)
[18] G. Boole, An investigation of the laws of thought on Which Are Founded the Mathematical Theories of Logic and Probabilities (Walton and Maberly., 1854)
[19] Rescorla, Michael, "The Computational Theory of Mind", The Stanford Encyclopedia of Philosophy (2024).
[20] Alan Turing, On Computable Numbers, with an Application to the Entscheidungs problem, Proceedings of the London Mathematical Society, 1936-37 at 2 (42): 230–265.

This work founded the mathematical basis for all modern computing and, by extension, artificial intelligence. Turing later proposed what became known as the "Turing Test" in his 1950 article "Computing Machinery and Intelligence," which asked the question "Can machines think?" and provided a practical test for machine intelligence derived from human responses based on indistinguishability.[21]

Simultaneous with Turing's theoretical endeavours, there were practical advancements in computing hardware that picked up speed during and following World War II. The ENIAC (Electronic Numerical Integrator and Computer) which was developed mostly to compute artillery firing tables, finished in 1945, was among the earliest general-purpose electronic computers and the ENIAC proved the potential of electronic machines to make complicated computations at unprecedented rates. [22]

John von Neumann's computer design architecture, described in his 1945 "First Draft of a Report on the EDVAC," defined the basic design of stored-program computers that continues to this day. This design, in which data and instructions are both stored in memory, made possible the creation of more versatile computing systems that could be programmed to carry out a vast range of tasks.[23] Warren McCulloch and Walter Pitts provided another significant contribution in 1943 which suggested artificial neural networks as a model of brain operation.[24] Their research indicated that basic networks of neurons were, in principle, capable of performing any arithmetic or logical function, providing a theoretical foundation for neural computation that would subsequently become the core of AI research.[25]

Meanwhile in 1948, information theory was founded, measuring information and offering mathematical models for learning data transmission and compression.[26] In

[21] Alan Turing, Computing Machinery and Intelligence, Vol LIX. MIND, 236: 433–60 (1950)
[22] Scott McCartney, ENIAC: The triumphs and tragedies of the world's first computer (Walker & Company., 1999)
[23] John von Neumann, First draft of a report on the EDVAC, Vol 15. IEEE Annals of the History of Computing, (1993)
[24] Warren S McCullogh & Walter H Pitts, “A Logical Calculus of the ideas Imminent in Nervous Activity, Vol 5 Bulletin of Mathematical Biophysics (1943).
[25] W S McCullough & W Pitts, A logical calculus of the ideas immanent in nervous activity, Vol 522. Bulletin of Mathematical Biophysics, (1990).
[26] C. E. Shannon, A Mathematical Theory of Communication, Vol. 27. The Bell System Technical Journal, (1948).

1949, it was often remarked that these machines are similar to what a brain would be if it were made of hardware and wire instead of flesh and nerves. It is therefore natural to call these machines mechanical brains. Also, since their powers are like those of a giant, we may call them giant brains.[27] Later on by 1950, computer game playing and search algorithms were discussed.[28]

By the early 1950s, the fundamental theoretical bases for artificial intelligence had already been laid. Computation could be put into formal form, machines can be programmed to execute logical calculations, neural networks provided a biologically-inspired computational paradigm, and information could be measured and manipulated based on mathematical laws. A checkers – playing program was created that improved its performance through experience and can be considered as the first demonstrations of machine learning.[29] These advances paved the way for the official designation of artificial intelligence as a specific area of study.

2.2.3 The Birth of AI as a Field

It is often remarked that the summer of 1956 was the official beginning of artificial intelligence as a separate scholarly field. John McCarthy organized the Dartmouth Summer Research Project on Artificial Intelligence Marvin Minsky, Nathaniel Rochester, and Claude Shannon, convened eminent researchers to consider the hypothesis that "every feature of learning or any other attribute of intelligence can in principle be so clearly formulated that a machine can be constructed to mimic it.[30] In this workshop, the name "artificial intelligence" was created as well as the field's lofty aim of building machines with common human-like intelligence. The Dartmouth Workshop had a bold agenda, with topics ranging from natural language processing, neural networks, to computational creativity and abstract reasoning. Although the

[27] Edmund Callis Berkeley, Giant Brains or Machine that think, (Science Editions Inc, 1961).
[28] Claude E. Shannon, Programming a Computer for Playing Chess, Vol. 41. Philosophical Magazine, (1950).
[29] A L Samuel, Some studies in machine learning using the game of checkers, Vol 3. IBM Journal of research and development, (1959)
[30]J McCarthy & M L Minsky et al., A proposal for the Dartmouth summer research project on artificial intelligence. Vol 27. AI magazine, (1955).

workshop itself did not yield any breakthrough technologies, it made AI a separate research field with its own objectives, methodology, and group of practitioners.[31]

The development of the LISP programming language was fundamental as it became the dominant language for AI research for decades due to its flexibility in manipulating symbolic expressions.[32] Logic Theorist was created at the Carnegie Mellon University which could prove mathematical theorems using symbolic reasoning is often considered as the first AI program.[33]

There are two main AI approaches that emerged in this age. Symbolic approach, which was backed by academics like McCarthy[34] and Simon,[35] focused on using formal symbols and rules for manipulating them to create symbolic representations of knowledge. Researchers like Frank Rosenblatt, on the other hand, used the connectionist approach, which was inspired by the brain's neuronal structures.[36]

The 1960s witnessed remarkable optimism about the potential of AI. The General Problem Solver demonstrated how computers could solve problems by the application of means – end analysis which is quite similar to human problem-solving strategies.[37] In 1965, it was remarked that machines will be capable, within twenty years of doing any work a man can do.[38] During this period, natural language processing emerged as a key field of research. The ELIZA program, created by Joseph Weizenbaum between 1964 and 1966, mimicked conversation by substituting and matching patterns, creating the appearance that it understood. Robotics and computer vision also made strides in the subject. Early computer vision systems were being developed at the Minsky-led MIT AI Lab, while Shakey the robot (1966–1972), one of the first robotic vehicles to

[31] Nills J Nilsson, The quest for artificial intelligence, (Cambridge University Press, 2009).
[32] J McCarthy, Recursive functions of symbolic expressions and their computation by machine, Part I, Vol 3. Association for Computing Machinery. 184-195 (1960).
[33] Allen Newell & H A Simon, The logic theory machine--A complex information processing System, Vol 2. IRE Transactions on information theory, 61-79 (1956)
[34] J McCarthy, Recursive functions of symbolic expressions and their computation by machine, Vol 3 Communications of the ACM (1960).
[35] Newell, A. & Simon, H. A. Computer science as empirical inquiry: Symbols and search, Vol 19 Communications of the ACM, (1976).
[36] Frank Rosenblatt, The perceptron: a probabilistic model for information storage and organization in the brain, Vol 65 Psychol Rev (1958).
[37] Allen Newell, Herbert A Simon et al. Report on a general problem solving program, Vol 256. IFIP Congress, (1959)
[38] H A Simon, The shape of automation for men and management, (Harper & Row, 1965).

perceive and reason about its surroundings, was created at Stanford Research Institute. Funding for AI research increased significantly during this time, especially from military organizations such as the Defense Advanced Research Projects Agency (DARPA) in the United States. This investment was a result of the strategic perceived value of AI technologies during the Cold War years.[39]

Despite such success, scientists started to find fundamental constraints in the scalability and strength of their methods as they tried to solve more sophisticated, real-world issues. The problems were more daunting than the initial optimism had envisioned, paving the way for
a period of recalibration in the field.

2.2.4 The First AI Winter

The period roughly between 1974 and 1980 tends to be named the "First AI Winter" when optimism, funding, and artificial intelligence research progress considerably collapsed. The downward trend was following a very positive period and preceded by various causative factors in convergence, uncovering the pitfalls of then-existing methods. By the mid-1970s, it had become apparent that the early AI programs, though impressively demonstrating in controlled settings, were having a hard time coping with the richness and uncertainty of real-world issues. The symbolic methods that were prevalent in early AI research were less useful when scaled up to manage the immense knowledge and contextual awareness needed for general intelligence.[40] The critics argued that human intelligence relies on tacit knowledge and situated understanding cannot be reduced to symbolic representations and rule-based processing.[41] Technical constraints started to become glaringly obvious here. Researchers started to face the so-called "combinatorial explosion" challenge, in which the computational powers needed for some AI methods increased exponentially with problem size. This rendered most AI methods impractical for solving hard real-world problems with the computing capacity prevalent at the time.[42]

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[39] Daniel Crevier, AI: The Tumultuous History Of The Search For Artificial Intelligence, (Basic Books, 1993).
[40] J Hendler, Avoiding another AI winter, Vol 23. IEEE Intelligent Systems, 2-4. (2008)
[41] H L Dreyfus, What computers can't do: A critique of artificial reason, (Harper & Row. 1972).
[42] S J Russell & P Norvig, Artificial intelligence: A Modern Approach (Pearson., 3rd ed. 2010).

During this period, important research continued despite the overall decline in interest and support. Some researchers create specialized special purpose systems with less ambitious but nonetheless achievable goals. The field of artificial intelligence arrived at a more realistic and less ebullient assessment of the challenges involved in creating artificial intelligence in 1980. The field had moved from its initial phase of speculation to more methodical study, opening the door for novel approaches that would lead to a resurgence of interest and development in the 1980s.

2.2.5 Expert Systems and Knowledge – Based Approaches

Expert systems emerged as the dominant paradigm during this era. This field experienced a significant revival after the first AI winter; it was mainly due to the commercial success of expert systems and knowledge based approaches. These expert systems were computer programs but were capable of capturing and applying the specialized knowledge of human experts in specific domains. These systems differ from the earlier AI systems as those relied on general problem – solving methods, and these systems gave out domain specific knowledge through certain rules or structured forms.[43]

The MYCIN, developed at Stanford University during the late 1970's gave out the potential for expert systems in specialised professional areas as it was designed to diagnose and recommend treatments for blood infections.[44] During this period, knowledge representation became a major focus of research. Semantic networks, frames, and scripts are just a few of the frameworks that have been proposed to represent various types of information. While script theory[45] offered a way to store sequences of occurrences and expectations, frame theory[46] supplied a framework for characterizing stereotyped situations. The development of expert systems also enabled researchers to create certain specialised tools so as to enable the program to adapt to

[43] Bruce G Buchanan & E H Shortliffe, Rule-Based Expert Systems: The MYCIN Experiments Of The Stanford Heuristic Programming Project, (Addison-Wesley, 1984).
[44] E H Shortliffe, Computer-based medical consultations: MYCIN, (Elsevier, 1976).
[45] M Minsky, A Framework For Representing Knowledge, The Psychology of Computer Vision, (1975).
[46] R C Schank & R P Abelson, Scripts, plans, goals, and understanding: An inquiry into human knowledge structures, Psychology Press, (1977).

various domains without rebuilding the underlying architecture. The development of the Fifth Generation Computer in Japan in 1982 was also very fundamental as it brought in a national initiative to fund these programs.

Expert systems had substantial drawbacks that would eventually cause interest to decline, despite the commercial excitement. Their knowledge bases tended to be fragile, functioning well in specific fields and faltering in novel circumstances. A major bottleneck that took up a lot of time for both domain experts and knowledge engineers was the process of acquiring knowledge, which involves translating human understanding into rules that machines can understand.[47] These systems also lacked the ability to learn from experience, i.e. the inability to update their knowledge bases.

Even though investment in AI technology was at an all-time high, these limitations were already becoming apparent by the mid-1980s. In the end, this conflict would lead to yet another period of field readjustment.

2.2.6 The Second AI Winter

The period from 1987–1993, commonly referred to as the "Second AI Winter," saw a significant drop in funding, business interest, and general interest in AI applications and research. Both technical limitations and market factors contributed to this collapse, which followed the expert systems boom of the early to mid-1980s.

During this period, the market for specialized hardware that had grown to support AI applications experienced a remarkable explosion. As the power and affordability of general-purpose workstations and personal computers increased, companies like Symbolics, Lisp Machines Inc. (LMI), and Thinking Machines Corporation that had made investments in creating specialized computers tailored for AI programming languages and techniques found themselves on the verge of bankruptcy or serious financial difficulties.[48] When businesses discovered that installing and maintaining expert systems was more costly and complex than anticipated and that returns on

[47] E A Feigenbaum, The Art Of Artificial Intelligence: Themes And Case Studies Of Knowledge Engineering Vol 2. Proceedings of the 5th international joint conference on Artificial intelligence, 1014-1029 (1977).
[48] J Hendler, Avoiding Another AI Winter, Vol 23. IEEE Intelligent Systems, 2-4. (2008).

investment were typically lower than anticipated, the "AI bubble" in the commercial sector burst. Many businesses that had invested heavily in AI technology during the expert systems boom scaled back or stopped their efforts completely.[49]

During this period, the research on neural networks began to gain momentum after the publication of the backpropagation algorithm. The algorithm provided an efficient method for training multi – layer neural networks.[50] Robotics research also continued during this period.

AI researchers' objectives and expectations had changed by the early 1990s, and their work was now focused on specific issues rather than general intelligence on par with that of humans. The groundwork for the field's eventual comeback was laid by this practical shift as well as new technical approaches that would soon demonstrate their value.

2.2.7 Statistical Methods and Machine Learning

It is often regarded that the period from 1993 to 2011 marked a significant shift in AI research and applications as it was substantially influenced by the increased prominence of statistical methods and machine learning approaches. It transitioned into a more mature phase as it was driven by newer data-oriented methods and also witnessed steady progress. This change in perspective was caused by a number of factors. Machine learning algorithms now have access to more training data than ever before because of the explosion of digital data from the rapidly expanding internet. Computation-intensive learning methods became more and more practical as Moore's Law continued to produce exponential development in computing power at cheaper prices.

IBM's statistical machine translation system, which was built in the early 1990s, learned translation patterns from parallel corpora of human-translated texts instead of hand-

[49]Daniel Crevier, AI: The Tumultuous History Of The Search For Artificial Intelligence, (Basic Books, 1993).
[50] E D Rumelhart, G E Hinton,et al. Learning Representations By Back-Propagating Errors, Vol 323. Nature, 533-536. (1986).

coded rules of language.[51] Decision trees and random forests provided interpretable models for a range of prediction problems, whereas k-means and other algorithms improved unsupervised learning capabilities.[52] Data mining as a discipline evolved alongside machine learning, with its emphasis on finding patterns and knowledge in large databases. Organizations ever more realized the importance of the data they gather, this resulted in investment in systems and processes to extract valuable insights out of this data.[53] The growing availability of computing power and data were instrumental in making these advances possible. The growth of the internet created enormous new sources of data, and improvements in hardware, especially in storage and processing power, made it possible to use data-intensive techniques on increasingly complex problems.[54]

AI applications came to show value in real-world applications across multiple domains. Speech recognition technology grew to the stage of commercial appeal, with items such as Dragon Naturally Speaking increasing market presence. Computer vision saw growth through implementation in medical imaging, manufacturing inspection, and security systems. Data mining methodologies showed up in areas such as fraud detection, customer relationship management, and scientific studies.[55] Around this time academic research in AI also became increasingly connected to related fields such as statistics, operations research and cognitive science.

This era brought certain significant developments and towards the end of the era, machine learning was firmly entrenched as the dominant paradigm for AI applications and research. The groundwork for Deep learning's revolutionary potential, which would characterize the next generation of AI research, had been laid. Beyond the boom-bust cycles of its early decades, the discipline had evolved into a model of steady, gradual advancement supported by empirical evidence.

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[51]P F Brown, S A Della Pietra, et al. The mathematics of statistical machine translation: Parameter estimation Vol 19. Computational linguistics, 263-311. (1993).
[52]L Breiman, Random forests, Vol 45. Machine learning, 5-32. (2001).
[53] U Fayyad, , Piatetsky-Shapiro, et al. From Data Mining To Knowledge Discovery In Databases, Vol 17. AI magazine, 37-37. (1996).
[54]A Halevy, P Norvig, et al. The unreasonable effectiveness of data, Vol 24, IEEE Intelligent Systems, 8-12. (2009).
[55] Russell, *supra* note 39.

2.2.8 The Deep Learning Revolution

This period witnessed a transformative revolution as the deep learning approach was adopted and this enabled AI to act as a central force in technological and economic development. The turning point that heralded the start of this revolution in deep learning occurred in 2012, when a deep neural network named AlexNet was created, it reached record-breaking performance in the ImageNet Large Scale Visual Recognition Challenge. AlexNet significantly beat out rival approaches, lowering error rates from 26% to 15.3% and proving the power of deep convolutional neural networks for visual recognition tasks.[56]

The development of GPU's i.e. Graphics Processing Units became well suited for parallel computations required by neural networks and the internet also developed massive datasets suitable for training these models and paved way for various algorithmic innovation like rectified linear units (ReLUs), and refine back propagation techniques, which increased training efficiency and effectiveness.[57] The creation of Generative Adversarial Networks enabled the creation of increasingly realistic synthetic images.[58] Another pivotal development took place in the year 2017, i.e. the introduction of the Transformer architecture, which later on formed the foundation for large language models that define the current generative AI era.[59] Deep learning commercial uses increased in a massive manner. Big tech companies such as Google, Facebook, Microsoft, and Amazon incorporated deep learning into their products and services, ranging from search engines and social media to cloud computing and e-commerce. Computer vision solutions extended to autonomous cars, medical imaging, security cameras, and retail analytics. Natural language gaining insight into ever more powerful virtual assistants, customer service robots, and content suggestion algorithms.[60]

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[56] A.Krizhevsky, I Sutskever, et al. Imagenet Classification With Deep Convolutional Neural Networks, Advances In Neural Information Processing Systems, (2012).
[57] I Goodfellow, Y Bengio, et al. Deep learning, MIT press, (2016)
[58] I Goodfellow , Pouget-Abadie, et al. Generative Adversarial Nets, Advances In Neural Information Processing Systems (2014).
[59] A Vaswani, N Shazeer, et al. Attention Is All You Need, Advances In Neural Information Processing Systems (2017).
[60] I M Jordan & T M Mitchell, Machine Learning: Trends, Perspectives, And Prospects, Vol 349. Science, 255-260. (2015).

Throughout the decade, interest gradually turned toward the limits and dangers of deep learning systems. Researchers found problems such as susceptibility to adversarial examples, brittleness to non-training distributions, lack of interpretability, and biases from training data. These issues would guide research agenda and regulatory discourse in the next era. Towards the end of the era, deep learning transformed the capabilities and applications of artificial intelligence creating a paradigm shift in the AI domain.

2.2.9 The Rise of Generative AI

Generative AI systems, which can create new content in a range of modalities like text, graphics, audio, and video, have suddenly and spectacularly emerged in the recent few years, and are evolving at a tremendous rate. Unprecedented developments in AI capabilities, greater public awareness of AI technology, and more contentious discussions about the implications of AI for society have all occurred during this time.

This revolution in generative AI was made possible by developments in large language models (LLMs). With its 175 billion parameters, OpenAI's GPT-3, which was released in 2020, showed impressive natural language generation skills, building on the Transformer architecture that was first presented in 2017.[61] Without task-specific training, GPT-3 could execute a variety of linguistic tasks, utilizing few-shot learning to adjust to novel situations in response to straightforward cues. This points us to how there has been a significant departure from the previous models that required extensive fine tuning for specific applications. Diffusion models represented a fresh advance in text-to-image modelling. OpenAI's DALL-E, which debuted in January 2021, combined GPT-3's linguistic comprehension with picture generation capabilities to demonstrate the ability to produce visuals from written descriptions.[62] The ecosystem for generative AI expanded swiftly to include multimodal systems that could work with many types of content. While some models, like Sora (2024), produced lifelike movies

[61] Ivan Belcic, What is GPT (generative pretrained transformer)?, IBM (18th September 2024) https://www.ibm.com/think/topics/gpt#:~:text=GPT%2D3%2C%202020,efficiency%20of%20the%20training%20process.

[62] Salim Oyinlola, DALL-E: Inside the Artificial Intelligence program that creates images from textual descriptions, PaperSpace (2022). https://blog.paperspace.com/dall-e-image-generator/

based on text descriptions, others, like GPT-4 (2023), integrated text and visual comprehension. Text-to-speech models like Eleven Labs created incredibly lifelike voice cloning features, and speech synthesis technology advanced to unprecedented levels of naturalness.

The creation of AI assistants based on extensive language models was a significant turning point in this period. After being introduced by OpenAI in November 2022, ChatGPT became the fastest-growing consumer application in history, with 100 million users within two months of its launch . Others, including Google's Bard (later renamed Gemini), Anthropic's Claude, and Meta's Llama models, were later able to provide conversational AI capabilities to billions of people worldwide.[63] While Dall·E is producing realistic to surreal visuals in response to almost any trigger, ChatGPT is producing human-sounding sermons, news updates, and responses to law school exam problems.[64] This boom led to the evolution of underlying architectures and training models significantly and human feedback was collected extensively. The commercial landscape for AI changed radically within this time. Investment in AI startups became unprecedented, with OpenAI, Anthropic, and Stability AI raising billions in investments.[65] Mature tech companies incorporated generative AI functionality into their product and service lines, from the AI-fortified Office bundle by Microsoft to the AI-capable search and workspace by Google tools. This period also witnessed the increased adoption of AI across diverse industries, for e.g. the Git Hub Copilot used in content creation, customer service and healthcare diagnostics etc.

Open-source AI projects gained traction during this time, countering the stronghold of proprietary models by large technology firms. Initiatives such as Meta's Llama models, Stability AI's Stable Diffusion, and other initiatives from smaller organizations such as Mistral AI democratized access to advanced generative models.[66] These open-source

[63] John Xavier, From Gemini, Claude to Llama: How AI titans shaped the industry in 2024, The Hindu (27th December 2024), https://www.thehindu.com/sci-tech/technology/from-gemini-claude-to-llama-how-ai-titans-shaped-the-industry-in-2024/article69032097.ece

[64] Robert A. McFarlane,Protecting artificial intelligence requires arsenal of intellectual property laws, Reuters (2023),https://www.reuters.com/legal/legalindustry/protecting-artificial-intelligence-requires-arsenal-intellectual-property-laws-2023-03-31/

[65] Sean Kinney, AI infrastructure—mapping the next economic revolution, RCR Wireless News (11th April 2025) https://www.rcrwireless.com/20250411/ai-infrastructure/ai-infra-revolution

[66] Mark Zuckerberg, Open Source AI is the Path Forward, Meta (23rd July 2024), https://about.fb.com/news/2024/07/open-source-ai-is-the-path-forward/

alternatives allowed for wider research, innovation, and deployment creating concerns regarding responsible release practices and possible abuse.[67] The technical capabilities of generative systems continued to advance rapidly and with the introduction of AI agents, the landscape became more complicated as it could navigate websites, execute code and perform complex sequences of actions[68], thus pointing to the fact that AI can do both content generation as well as accomplishing certain tasks. Discussions on artificial general intelligence (AGI), or systems that could equal or outperform humans in a variety of cognitive tasks, were reignited by the developing capabilities of generative AI. As generative AI developed, more attention was paid to alignment—making sure that these systems behaved in accordance with human aims and ideals. Techniques like red-teaming, constitutional AI, and various forms of human feedback reinforcement were used to allay worries about the security, honesty, and usefulness of more powerful systems.[69]

The quick pace of development and rollout of generative AI heightened anxieties regarding the possible risks and social implications. Concerns such as misinformation, deep fakes, job losses, copyright, bias, and privacy abuses brought forth demands for governance models and ethical standards.[70] Public high-profile open letters such as that of March 2023 demanding the halt of training systems more advanced than GPT-4 showcased increasing concern with the speed of AI progress.[71] By early 2024, generative AI was a revolutionary technology with profound impacts on work, creativity, learning, and society. The explosive rate of advancement gave little indication of slowing down, with further improvements in ability, efficiency, and integration into current tools and workflows. With these technologies increasingly developing, questions of governance, access, economic effects, and human-AI collaboration became growing concerns in both technical and policy circles. Issues of copyright for AI-generated works, potential misuse for disinformation, and labour

[67] S Biderman, H Schoelkopf, et.al., Pythia: A Suite for Analyzing Large Language Models Across Training and Scaling, Proceedings of the 40th International Conference on Machine Learning, (2023)
[68] G Mialon, R Dessì, et.al, Augmented language models: a survey, Transactions on Machine Learning Research (2023).
[69] Yuntao B, Constitutional AI: Harmlessness from AI Feedback, Anthropic (2022).
[70] European Parliament, The ethics of artificial intelligence: Issues and Initiatives, Panel for the Future of Science and Technology (2020).
[71] Future of Life Institute, Pause Giant AI Experiments: An Open Letter, Future of Life Institute (12th April 2023), https://futureoflife.org/document/policymaking-in-the-pause/

market disruption have become pressing concerns for policymakers and society at large. These concerns directly intersect with international trade and intellectual property domains, which will be explored in subsequent sections of this chapter.

2.3 THE INTERSECTION OF AI WITH INTERNATIONAL TRADE

2.3.1 AI as a Trading Good and Service

The emergence of Artificial Intelligence as a prominent factor in today's world has been traced in the previous section. Today, artificial intelligence is indeed a significant category of international trade frameworks, as it acts as a good and a service at the same time. This special nature puts traditional trade classification systems and regulatory principles used to distinguish sharply between physical products and intangible services into a tough spot. Being a tradable commodity, AI systems typically encompass hardware components in the form of dedicated processing units, sensors, and physical infrastructure.[72] These physical aspects fit relatively neatly into the current trade categories subject to accords like the General Agreement on Tariffs and Trade (GATT) and its successor arrangement under the World Trade Organization.[73] Yet, even in their physical forms, AI systems pose new challenges because of their embedded intellectual property and technological complexity, which may not be sufficiently addressed by conventional customs valuation techniques or product classifications.[74] The classification problem becomes especially problematic with AI services integrated into broader digital platforms or provided via APIs (Application Programming Interfaces). This classification uncertainty creates arbitrage opportunities for regulation and potentially uneven treatment across jurisdictions.

In addition to conventional trade structures, the rise of data as the "new oil" in the global economy has deep implications for AI trade. Having access to data is critical to AI system development, training, and refinement, rendering flows in data a fundamental

[72] WTO Report, Trading with intelligence How AI shapes and is shaped by international trade (2024).
[73] M Burri, The governance of data and data flows in trade agreements: The pitfalls of legal adaptation, 51 UC Davis Law Review, 65-132. (2021).
[74] Dan Ciuriak, The economics of data: Implications for the data-driven economy. In Data governance in the digital age, Centre for International Governance Innovation (2018).

element in AI trade.[75] It is regarded that nations with greater pools of data can generate comparative advantages in AI development and, in turn, shift older tendencies in international specialization and trade.[76] Intellectual property regimes have a major influence on AI trade patterns. Strong IP protection in a country can attract greater investment in AI research and development but possibly restrict knowledge diffusion. In contrast, weaker IP systems can allow technology transfer while discouraging incentives to innovate.[77]

The economic value of AI trade is increasing substantially.[78] The rapid growth points to the diffusion of AI technologies across sectors and geographic markets, transforming industries from healthcare and finance to manufacturing and retail. AI's dual nature as a service and a good will put existing trade frameworks to the test more and more as it continues to function as both a traded good and a disruptive force in global value chains. Future trade governance will inevitably need to adopt new strategies that are better adapted to the hybrid nature of digital technologies like artificial intelligence (AI). This may entail specific clauses in trade agreements and specialized regulatory frameworks.[79]

2.3.2 Cross – Border Data Flows and AI Development

The development and application of artificial intelligence depends heavily on cross-border data flows, which act as both vital sources of input for AI systems and delivery channels for AI services. Their governance has emerged as a key factor influencing global AI trade trends and market dynamics.

The magnitude of international data flows has grown exponentially, with cross-border bandwidth increasing 45 times between 2005 and 2021, well ahead of increases in

[75] N Cory, Cross border data flows: Where are the barriers, and what do they cost?, Information Technology and Innovation Foundation (1st May 2017), https://itif.org/publications/2017/05/01/cross-border-data-flows-where-are-barriers-and-what-do-they-cost/
[76] Avi Goldfarb, D Trefler, AI and international trade. In A. Agrawal, J. Gans, & A. Goldfarb (Eds.),The economics of artificial intelligence: An agenda, University of Chicago Press. (2018).
[77] Keith E Maskus, Intellectual Property Rights in the Global Economy (2000).
[78] Mark, *supra* note 65.
[79] Shamel Azmeh, Christopher Foster, et.al, The International Trade Regime and the Quest for Free Digital Trade, , Vol 22, International Studies Review, 671–692. (2020).

traditional trade or investment flows.[80] This vast expansion mirrors not just consumer internet usage but also the data-driven nature of international business operations, such as AI development and utilization. The United Nations Conference on Trade and Development states that data-intensive international transactions now account for roughly 50% of all services traded worldwide.[81] For AI development specifically, cross-border data access serves several critical functions. The training of data is also done on such aspects, systems that are trained on geographically and culturally varied datasets typically demonstrate better performance and fewer biases.[82] Global data flows enable cross collaborative AI research within institutional and national borders, driving innovation through the sharing of knowledge and complementary expertise.[83] These flows ensure the efficient scaling of AI services to global markets through cloud infrastructure and distributed computing networks.[84]

A potential compromise between unrestricted flows and localization has been suggested: international collaboration to develop standardized standards and compatible data governance frameworks. Through the reciprocal acceptance of comparable standards, the Asia-Pacific Economic Cooperation's Cross-Border Privacy Rules system and the OECD's Privacy Framework aim to strike a compromise between economic facilitation and data protection.

The concentration of data resources among major technology firms and a handful of countries has raised concerns about digital colonialism and data sovereignty It is argued that the ability to collect, process, and derive value from data increasingly determines economic power in the global AI ecosystem. This dynamic advantages countries with large digital economies and established technology sectors, potentially reinforcing or exacerbating existing international inequalities.[85] Looking forward, the governance of

[80] McKinsey Global Institute, Global flows: The ties that bind in an interconnected world, McKinsey & Company (November 15th 2022), https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/global-flows-the-ties-that-bind-in-an-interconnected-world

[81] UNCTAD, Digital economy report 2021: Cross-border data flows and development: For whom the data flow, United Nations Conference on Trade and Development (2021).

[82] James Zou & Londa Schiebinger, AI can be sexist and racist - it's time to make it fair (18 July 2018), https://www.nature.com/articles/d41586-018-05707-8

[83] OECD, The OECD Going Digital Measurement Roadmap, OECD Digital Economy Papers, (2022).

[84] Francesca Casalini. & Javier López González, Trade and cross-border data flows, Vol 220 OECD Trade Policy
Papers, (2023).

[85] P J Singh, Economic rights in a data-based society: Collective data ownership, workers' rights, and the role of the state. Friedrich-Ebert-Stiftung, (2020).

cross-border data flows will likely determine the degree of integration or fragmentation in the global AI ecosystem. The cross-border data flows show the intersection of AI with trade and it calls for interoperable frameworks that balance innovation, privacy, security, and development objectives could facilitate more inclusive participation in the global AI economy while respecting legitimate regulatory differences

2.3.3 Trade Policy Implications for AI Technology

Artificial intelligence's emergence as a disruptive technology has profound effects on trade policy norms, challenging established ideas and requiring innovative approaches to optimize gains while controlling novel dangers and distributional concerns. Trade liberalization faces reconsideration in the context of AI technologies. The question as to whether conventional free trade approaches adequately address the various power asymmetries stated in the previous paragraphs and on the other hand there is a push for "digital industrialization."[86] A major obstacle facing the global trading system in the AI era is the conflict between openness and strategic capacity growth. Data governance has become a crucial area of trade policy, with conflicting ideas on how to strike the right balance between legal regulation and free flows. The different views adopted by the states add to dilemma, United states[87] advocated for minimal restriction on cross border data flow, the European Union[88] has a more regulatory centered approach and on the other hand China[89] focused on cyber sovereignty and security considerations.

In the context of artificial intelligence, the relationship between trade policy, labour market institutions, and social protection systems becomes more apparent. While AI technologies spur sectoral change and even replace workers of varying skill levels, trade adjustment assistance programs could need substantial extension and restructuring to sustain political backing for open trading regimes.[90]

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[86] C Foster, & S Azmeh, Latecomer economies and national digital policy: An industrial policy Perspective, Vol 56 Journal of Development Studies, (2020).

[87] Susan Ariel Aaronson, Data is different: Why the world needs a new approach to governing cross-border data flows, Vol 21 Digital Policy Regulation and Governance (2019).

[88] Edorado Celeste, Digital sovereignty in the EU: Challenges and future perspectives. In L. Floridi & M. Taddeo (Eds.), The ethics of digital well-being (2019)

[89] Samm Sacks, New China data privacy standard looks more far-reaching than GDPR. Center for Strategic and International Studies.(January 29th 2018), https://www.csis.org/analysis/new-china-data-privacy-standard-looks-more-far-reaching-gdpr

[90] Dani Rodrik, New technologies, global value chains, and developing economies, Vol 1 Pathways for Prosperity Commission Background Paper Series (2018).

Intellectual property terms in trade agreements considerably influence the development and dissemination of AI technologies. Conventional IP mechanisms were not created with AI-created innovations or machine learning training procedures in consideration, generating protection gaps and chances of overreach.[91] Recent trade deals such as the USMCA and the US-Japan Digital Trade Agreement have included provisions on algorithmic transparency, source code protection, and restrictions on forced technology transfer that directly affect AI development.[92] In addressing these complex issues, trade policymakers face crucial challenges about how to properly balance collaboration and competition in the development of AI. While global cooperation offers efficiency benefits and potential win-win outcomes, strategic and security considerations need protective measures and tech decoupling in some industries.[93] This document will mainly focus on addressing the intersection with regard to the intellectual property norms especially copyright.

2.4 THE CONVERGENCE OF AI & INTELLECTUAL PROPERTY RIGHTS

2.4.1 Historical Context and Traditional Approaches

The intersection of IPR and AI is relatively new, but the application of IPR norms for the protection has been relevant since the 1970's, especially when the US office permitted the registration of software.[94] The extent of copyright protection of software has been progressively clarified by court decisions. The landmark case *Computer Associates v. Altai*[95] set the "abstraction-filtration-comparison" test for ascertaining which aspects of computer programs are protectable, distinguishing between protectable expression and unprotectable ideas, procedures, and methods of operation. Similar methods have been used in other jurisdictions, even though with substantial differences in terms of application. On the other hand, patent protection for software-created inventions has followed a more complex and inconsistent path. The European

[91] Tabrez Y Ebrahim, Artificial intelligence inventions & Patent Ownership, Vol 125 Penn State Law Review (2021).
[92] Office of the United States Trade Representative, National trade estimate report on foreign trade barriers (31st March 2025)
[93] Henry Farrell & Abraham L. Newman, Weaponized Interdependence: How Global Economic Networks Shape State Coercion, Vol 44 *International Security* (2019).
[94] P Samuelson, Functionality and expression in computer programs, Vol 31 Berkeley Technology Law Journal (2016)
[95] 119 A.L.R.Fed. 741

Union and United States have had a restrictive outlook on the patentability of computer-generated programs. Although these frameworks never foresaw the difficulties of autonomous creative AI, they set a precedence for safeguarding computational systems.

The resolution of AI-specific intellectual property challenges is based on the historical development of software and algorithm intellectual property protection. These early models set key precedents but were "essentially constructed for human-created works and human-implemented processes" and not for systems with emergent capabilities.[96] The hallmark of this history has been striking a balance between promoting innovation through exclusivity and granting broad access to underlying technologies, a balance that still influences discussions about artificial intelligence and intellectual property today.

2.4.2 Trade Secrets, The Room for Protection

Due to the inadequacies of patent and copyright protection, most AI developers increasingly turn to trade secret law to safeguard their innovations. OpenAI, Google DeepMind, and Anthropic safeguard their most prized intellectual assets—training procedures, data preprocessing techniques, and model weights—as trade secrets.[97] Protection of trade secrets has several benefits for AI technologies. Unlike patents, trade secrets do not need to be disclosed or registered and can theoretically continue forever. The move towards trade secrecy risks fragmenting AI research and places power in the hands of a small group of well-resourced actors and this focal effect can act to increase other existing disparities of AI development competence among countries and institutions.[98]

Moreover, protection of trade secrets involves confidentiality, which is inconsistent with increasing transparency and explainability for AI, particularly for those deployed in high-risk domains.[99] This reliance on trade secrets can be a major challenge for

[96] Pamela Samuelson, AI authorship? Vol 63 Communications of the ACM (2020).
[97] Mark A Lemley & Bryan Casey, Fair learning, Vol 99 Texas Law Review, 743-812 (2020).
[98] Rebecca Crootof, Artificial intelligence research needs responsible publication norms, Lawfare (October 24, 2019).
[99] Jenna Burrell, How the machine 'thinks': Understanding opacity in machine learning algorithms, Vol 3 Big
Data & Society (2016).

International governance. The intersection of AI and intellectual property rights constitutes a core test of legal infrastructures crafted prior to the prospect of computational creativity. This dilemma will probably need new solutions recognizing AI's unique strengths while keeping essential principles alive for encouraging progress and safeguarding human creativity.[100] Achieving the balance is among the most substantive challenges for policy on innovation today.

2.4.3 Copyright Protection and AI

Copyright law has long safeguarded software in one way or another, such as source code as literary works and user interfaces as audiovisual works. These protect only the expression of ideas and not the ideas themselves or the functional elements of the software.[101] This division becomes increasingly problematic for AI systems. Neural networks rely on statistical patterns identified during training rather than human-written instructions to function. This basically undermines the distinction made by copyright doctrine between concepts that are not protected and expression that is. It is observed that the value of many AI systems lies not in their readable code but in the learned weights and connections that emerge through training—a form of expression that doesn't neatly fit existing copyright categories.[102]

Generative AI systems do present unprecedented copyright challenges along multiple dimensions. First, these systems typically train on massive datasets that may contain copyrighted materials.[103] Second, generative AI can produce outputs, which could be in resemblance with the original work, i.e. it can be created without copying but could capture the essence of the original expression.[104] Thirdly, the dispute as to the authorship of the AI comes into the picture and it brings in a legal dilemma as the current legal regime only accounts for human creativity. This points out that the

[100] Pamela Samuelson, The copyright principles project: Directions for reform, Vol 36 Berkeley Technology Law Journal (2010).
[101] Samuelson, P, Text and data mining of in-copyright works: Is it legal? Communications of the ACM, (2020).
[102] J P Liu, The new originality, Indiana Law Journal, (2021).
[103] Benjamin L. W. Sobel, Artificial Intelligence's Fair Use Crisis, Vol 41 The Columbia Journal of Law & The Arts (2017).
[104] James Grimmelmann, Copyright for literate robots, Vol 107 Cornell Law Review (2016).

intersection brings in numerous concerns and the same will be dealt with in detail in the following chapter.

2.5 CONCLUSION

The development of artificial intelligence from its philosophical roots to the present age of generative AI is one of the most revolutionary technological advances in human history. This chapter has mapped this incredible journey, showing how AI has developed through different stages of development, each with specific methods, capabilities, limitations, and uses. The shift from early symbolic representations and expert knowledge bases to statistical techniques, machine learning algorithms, and finally to deep learning architectures that can generate human-like content, illustrates not just incremental progress but paradigmatic changes in how computational systems represent information and interact with humans.

What comes out of this historical path is a vision of AI development that has been neither linear nor predictable. The discipline has witnessed phases of accelerated progress interrupted by "AI winters" of decreased funding and interest, only to revive with new strategies that bettered past constraints. This trend mirrors the intricate interplay between theoretical breakthroughs, computational power, data availability, and real-world applications that have cumulatively influenced the trajectory of AI research and development. The present generative AI revolution, as represented by large language models such as GPT-3 and GPT-4, multimodal systems, and text-to-image generators like DALL-E, is the culmination of these past developments, but also the start of a new era in AI's evolution.

As artificial intelligence has developed, it has more and more aligned itself with two key areas of global governance: international trade and intellectual property rights. The crossroads of AI with these spaces brings unprecedented issues that conventional regulatory structures and legal principles are poorly suited to meet. AI systems operate as both tradable commodities and as services, disrupting settled categorizations under international trade law. In addition, the intrinsic significance of cross-border data flows to AI development and utilization raises complicated issues of data sovereignty,

protection of privacy, and fair access to technological advantages by nations at various levels of development.

The fast-paced development of generative AI systems raises complex copyright issues that go beyond traditional paradigms. Such systems learn from large datasets that may include copyrighted works, produce outputs that might look like existing works without copying, and pose deep questions regarding the essence of authorship when creative processes are mediated by advanced computational systems. The increasing dependence on trade secrets as the main protection mechanism for AI innovations also makes it more complicated, with possible negative repercussions on transparency and equal access while assuming power by richly endowed technological players.

The intersection of AI with intellectual property and trade systems is not a technical issue but a qualitative change in how value is produced, assigned, and transferred within the global economy. Successfully adapting to this change will necessitate regulatory systems that are at once principled and flexible, in a position to adapt to emerging technologies that evolve rapidly.

The analysis laid out in this chapter provides the background for a more in-depth analysis of the particular legal issues related to generative AI, specifically in connection with copyright law in various jurisdictions. As we move into Chapter 3, we will expand upon this historical and conceptual basis to examine how various legal systems are struggling with issues of authorship, originality, fair use, and infringement when applied to AI-created works. This examination will further shed light on the conflicts between current legal principles and new technologies, suggesting directions for regulatory innovation that can effectively regulate the interface of artificial intelligence, international trade, and intellectual property in the digital economy.

CHAPTER 3

UNDERSTANDING THE LEGAL CHALLENGES WITH EMPHASIS ON THE COPYRIGHT LAWS OF VARIOUS NATIONS.

3.1 INTRODUCTION

The explosive growth of artificial intelligence (AI) technologies has paved the way for changes throughout many sectors of the world economy. As those technologies develop further, they increasingly overlap with traditional legal regimes, most notably intellectual property systems formulated in an age antecedent to the advanced capacities of current AI systems. This chapter explores the intricate relationship between AI and copyright law—a relationship which tests elementary legal principles and poses deep questions regarding creativity, authorship, and the right scope of intellectual property protection in the era of digitization.

AI developers have made tremendous strides in the generative production of expressive media, including art, many of which were realized in 2022 with consumer-ready apps.[105] Copyright law, long based on human invention and authorship, now has to deal with the fact that AI models can create works indistinguishable from human-authored ones. With DALL E's artistic depictions to GPT models' literary works, AI-created outputs pose fundamental issues regarding whether and to what extent copyright protection should be extended.[106] These issues are not simply scholarly; they have tremendous implications for incentives for innovation and the commercial exploitation of AI technologies. The relevance of copyright implications during the AI age cannot be overstressed. The more integrated AI technologies become in creative processes, the more imperative it is to have explicit legal frameworks to instill certainty in developers, users, and content creators. Furthermore, different approaches to copyright protection in various jurisdictions can pose substantial obstacles to cross-border transfers of AI

[105] Michael D. Murray, Generative At Art: Copyright Infringement And Fair Use, Vol 26 SMU Science and Technology Law Review, (2023)
[106] Pamela Samuelson, AI authorship? Vol 63 Communications of the ACM (2020).

technologies and AI-created content, which can actually limit international trade and technological innovation.[107]

This chapter presents a detailed examination of copyright issues in the context of AI, covering key principles, comparative legal frameworks, and new regulatory mechanisms. The analysis will advance from theoretical reflections on authorship and originality to practical matters of copyright enforcement and regulatory harmonization. Through this examination, the chapter seeks to determine existing gaps in legal protection and likely avenues for the creation of coherent international norms for AI and copyright. It then gives a comparative assessment of copyright systems in significant jurisdictions, including differences in methodology and implications for international trade. Later sections consider copyright issues concerning training data and regulatory loopholes that pose challenges to consistent international regulation. The chapter ends by integrating major findings and creating a link to algorithmic collusion problems addressed in Chapter 4.

3.2 FUNDAMENTAL COPYRIGHT PRINCIPLES IN THE AI CONTEXT

3.2.1 Traditional Copyright Regime and its Application to AI

Copyright law has long protected "original works of authorship fixed in any tangible medium of expression." This system, established to safeguard human creative expression, poses great conceptual difficulties when extended to AI technologies. The key pillars of copyright include protection of originality, authorship, and creation, must be reevaluated in response to AI's ability to independently produce content that simulates human creative expression.[108] The application of traditional copyright doctrine to works created by AI poses essential threats regarding the limits of intellectual property protection. The emergence of progressively more autonomous generative algorithms circumvents the anthropocentric model of authorship that has

[107] World Intellectual Property Organization, WIPO Conversation on Intellectual Property and Artificial Intelligence: Revised Issues Paper, (Issued on 2020).
[108] Molly Torsen Stech, The Semantics of Authorial Originality: Four Pillars, Vol 29 Texas Intellectual Property Law Journal (2022).

underpinned copyright law since its beginning.[109] This anthropocentric model presumes human intentionality and agency in the creative process—hypotheses that prove challenging when extended to advanced AI systems.

The conventional grounds for copyright protection have both utilitarian and natural rights approaches. Utilitarians base copyright on the belief that copyright acts as an incentive to creativity because it provides temporary monopoly rights to authors.[110] The natural rights approach, more dominant in continental European systems, sees copyright as acknowledging the natural bond between authors and their works.[111]Both explanations are complicated when the "creator" is an AI system without consciousness, legal personhood, or the capacity to react to economic incentives.

The idea of copyright protection came from a notion to encourage human innovation and creativity through the bestowal of limited monopoly rights to innovators. Nevertheless, AI systems do not need these incentives, raising the question of whether providing copyright protection for AI-generated works further the basic purpose of copyright law. Copyright law is designed to solve a specific economic problem: creating incentives for creative production that might otherwise be undersupplied because of the ease of free riding. [112] Additionally, the doctrinal framework of copyright law assumes a simple chain of causation between human creativity and protected expression. AI technology breaks this chain by injecting algorithmic processes that can function independently of immediate human control, thus defying conventional conceptions of creative causation.[113]

[109] J Deltorn & Franc Macrez, Authorship in the Age of Machine Learning and Artificial Intelligence, in Research Handbook on Intellectual Property and Artificial Intelligence, R. Abbott(ed.), Edward Elgar Publishing, (2023).
[110] Robert Yu, The Machine Author: What Level Of Copyright Protection Is Appropriate For Fully Independent Computer Generated Works?, Vol 165 University Of Pennsylvania Law Review (2017).
[111] Baldwin, Peter, The Battle between Anglo-American Copyright and European Authors' Rights." In The Copyright Wars: Three Centuries of Trans-Atlantic Battle, Princeton University Press, (2014).
[112] James Grimmelmann, There's No Such Thing as a Computer-Authored Work, Vol 39 Columbia Journal of Law & the Arts, (2016).
[113] C Craig & I Kerr, The Death of the AI Author, Vol 52 Ottawa Law Review, (2022).

3.2.2 Originality, Authorship and Creativity Requirements

Originality is a fundamental requirement of copyright protection in all jurisdictions, though its exact definition differs. In the US, after *Feist Publications, Inc. v. Rural Telephone Service Co*[114]., originality entails independent creation and a "modicum of creativity." The European model, set out in such cases as *Infopaq International*[115], entails a work being the "author's own intellectual creation." The UK historically used the "skill, labor, and judgment" test, although this has been harmonized in response to EU efforts.

When invoked in the context of AI-generated creations, these standards of originality pose certain complex issues. When an AI system creates something based on patterns found in training data, does it pass the test of independent creation? If a system is set up to emulate styles or forms already present, can its productions qualify as inventive enough? These questions grow especially intense as AI systems become more advanced and autonomous. Authorship conditions pose even more elemental challenges.[116] Copyright conditions traditionally vest initial ownership rights in the human author who created a work. But AI systems are not persons under the law and have no power of ownership. This poses potential ownership vacuity for works produced autonomously by AI systems.[117] Without an eligible author, no copyright can be had; the work is free to copy by everybody.[118]

There have been different theoretical models proposed to respond to this authorship conundrum. Some researchers call for the acknowledgment of the AI system as an author, while others advocate for assigning authorship to the developer, user, or owner of the system. Both methods have unique doctrinal issues and policy concerns that will be examined in detail later in this chapter.

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[114] 499 U.S. 340 (1991)

[115] Case C-5/08, Court of Justice of the European Union (2009).

[116] Adnan Masood, Intellectual Property Rights and AI-Generated Content — Issues in Human Authorship, Fair Use Doctrine, and Output Liability, Medium (4th April 2025), https://medium.com/@adnanmasood/intellectual-property-rights-and-ai-generated-content-issues-in-human-authorship-fair-use-8c7ec9d6fdc3

[117] Bridy Annemarie, Coding Creativity: Copyright and the Artificially Intelligent Author, Vol 5 Stanford Technology Law Review, (2012).

[118] Jane C Ginsburg & Luke Ali Budiardjo, Authors and Machines, Berkeley Technology Law Journal (2019).

3.2.3 Fixed Expression versus Algorithms and Machine Learning

Copyright protection applies only to the expression of fixed ideas and not to ideas themselves. This distinction, commonly called the idea/expression distinction, gets complicated in the context of machine learning algorithms and AI systems. The algorithms behind AI capabilities are processes of function as opposed to content of expression, making them beyond the usual extent of copyright protection.[119]

Neural networks and other machine learning algorithms occupy a legal gray area.[120] Although the source code used to implement these models will be copyrightable, the trained weights and parameters that constitute a model's functionality can be regarded as unprotectable functional elements.[121] Raw numbers that make up an educated model squarely land on the 'unprotectable idea' side of the idea/expression continuum.[122] In addition, outputs produced by AI systems raise independent copyright concerns. When AI systems produce text, images, or music, such outputs can meet the fixation requirement for copyright protection. But their protection eligibility still relies on meeting authorship and originality demands, which, as noted earlier, are still disputed within the AI context.[123]

Excessive protection can act to suppress innovation by limiting access to basic building tranches of AI development, while insufficient protection can defeat investment in innovative uses of AI technology. This conflict highlights the necessity of precisely balanced legal responses that acknowledge the peculiarities of AI systems without sacrificing the essentials of copyright law.

3.3 AI – GENERATED WORKS AND ASSOCIATED AUTHORSHIP DILEMMA

[119] M Lemley & B Casey, Fair Learning, Vol 99 Texas Law Review (2023).
[120] Vishnu S, Navigating the Grey Area: Copyright Implications of AI Generated Content, Vol 29 Journal of Intellectual Property Rights (2024)
[121] Margot E. Kaminski & Meg Leta Jones , Copyright and Software: The Evolution of Protection, Yale Journal of Law Forum (2024).
[122] B Sobel, Artificial Intelligence's Fair Use Crisis, Vol 41Columbia Journal of Law & the Arts (2023)
[123] Bruce Boyden, Emergent Works, Vol 39 Columbia Journal of Law & the Arts (2020).

3.3.1 Theoretical Framework Involved

The issue of authorship for AI-generated content has evoked varied theoretical interventions among legal commentators and policymakers. These frameworks strive to balance traditional copyright principles with the technical realities of machine learning and generative AI. One approach suggests that AI should be treated as a tool employed by humans, similar to a word processor or camera. In this "tool theory," AI-generated work copyright would be owned by the individual who employed the AI system to generate the work. This model preserves human authorship as the core prerequisite for copyright protection but recognizes the instrumental contribution of AI to the creation.[124] Another framework proposes acknowledging the programmer or developer of the AI system as an author of output it produces. This framework mainly assigns authorship to the individuals who created the conditions for the AI creative output by programming and training the system. This method recognizes the creative decisions made in the development of AI that eventually determine the created works.[125] A third model suggests a "work-made-for-hire" approach, in which the AI system is given treatment akin to an employee or contractor producing works under supervision and this would attribute authorship to the entity that ordered or manages the AI system.[126]

The "joint authorship" model identifies multiple participants—possibly including developers, users, and data contributors—as co-authors of AI-generated works.[127] Though this strategy
acknowledges the spread of creative agency in AI systems, it raises practical issues with regard to the delegation of rights and duties among various stakeholders.[128] Lastly, some researchers recommend a "public domain" solution, in which works self-created

[124] Mackenzie Caldwell, What Is an "Author"? Copyright Authorship of AI Art Through a Philosophical Lens, 61 HOUS. L. REV. 411 (2023).
[125] Samantha Fink Hedrick, I "Think," Therefore I Create: Claiming Copyright in the Outputs of Algorithms, Vol 8 JIPEL (2019).
[126] Xiao, Y. Decoding Authorship: Is There Really no Place for an Algorithmic Author Under Copyright Law?, IIC (2023).
[127] Pamela Samuelson, Allocating Ownership Rights in Computer-Generated Works," Vol 49 University of
Pittsburgh Law Review (2022).
[128] A Ramalho, Will Robots Rule the (Artistic) World? A Proposed Model for the Legal Status of Creations by Artificial Intelligence Systems, Journal of Internet Law (2017)

by AI systems would be left unprotected by copyright. This approach privileges public access to content generated by AI systems while maintaining copyright protection for works that entail considerable human creative effort. Placing AI-generated works in the public domain preserves the incentive structure for human creativity while avoiding the potential market distortions that might result from granting monopoly rights over machine outputs.[129]

Proposals to acknowledge AI systems as legal authors, either through legal fiction or a restricted legal personhood are included in more controversial models. These methods are heavily criticised from a doctrinal and philosophical standpoint, even though they may better represent the autonomous creative capacity of advanced AI systems.

3.3.2 Understanding the Human Involvement Spectrum

The variety of uses of AI in creative contexts requires a sensitive comprehension of human participation in a range of creative processes. Understanding the distinction between AI-assisted productions, AI-generated productions with human participation, and completely autonomous AI-generated productions is required.[130]

AI-assisted works have a high level of human creative contribution, and AI systems merely act as advanced tools. Some of these are digital artists applying AI filters or writers using AI-facilitated editing suggestions. Copyright protection typically applies in such instances to the subsequent works, authorship lying in the human creator exercising control over the final expression.[131] AI-generated works with human participation fall in the middle of the spectrum. Such works result from collaborative activities in which humans initiate with preliminary prompts, choose parameters, or curating outputs, but the substantive content is produced by the AI system. Legal responses to such works differ from jurisdiction to jurisdiction, with some emphasizing

[129] E. Bonadio, S. Burke, et al., The Copy in Copyright in *Non-Conventional Copyright* 65 – 82 (E. Bonadio et al. eds., 2018).
[130] J Deltorn & Franc Macrez, Authorship in the Age of Machine Learning and Artificial Intelligence, in Research Handbook on Intellectual Property and Artificial Intelligence, R. Abbott(eds.), Edward Elgar Publishing, (2023).
[131] Mackenzie, *supra* note 16

human creative decisions' importance in establishing copyright eligibility.[132] Most difficult for conventional copyright systems is the category of fully independent AI-generated works. These are works created by AI systems functioning with no particular human guidance beyond their initial training and programming. As these systems become increasingly sophisticated and autonomous, the human input-AI output linkage grows more remote, making it harder to determine authorship.[133]

The above paragraphs do point out that the human-machine interface in creative processes is not but dynamic, which means that the whole concept is evolving with technological capabilities and usage patterns.[134] As the classification works along this spectrum depending on both technological and contextual factors, it leads to certain complications with regard to legal classification, so as to accommodate the evolving human – machine creative relationships.

3.3.3 Legal Status of AI Generated Works in various Jurisdictions

The legal status of works created by AI differs greatly between jurisdictions, representing contrasting responses to the authorship conundrum. These contrasting responses give rise to a difficult international landscape for AI-generated work protection under copyright.

The United States Copyright Office has long argued that human authorship is needed for copyright protection. That argument was recently put to the test in *Thaler v. Perlmutter*, in which the U.S. District Court for District of Columbia supported the Copyright Office denial of registration of a photo purportedly designed independently by an AI system named "Creativity Machine."[135] The court confirmed that "human authorship is a bedrock requirement of copyright" according to U.S. law.

[132] Jane C Ginsburg & Luke Ali Budiardjo, Authors and Machines, Berkeley Technology Law Journal (2019).
[133] Daniel J Gervais, The Machine as Author, Vol 105 Iowa Law Review, (2020).
[134] Niva Elkin Koren, "Copyright in a Digital Ecosystem: A User Rights Approach," in Copyright Law in an Age of Limitations and Exceptions, R. Okediji (ed.), Cambridge University Press, (2023).
[135] Thaler v. Perlmutter, No. 22-cv-01564 (D.D.C. Aug. 18, 2023)

The European Union has not taken a common stance on AI authorship, although the copyright directive generally assumes human authors. The 2023 European Parliament resolution on AI innovation recognizes the necessity for more explicit guidance concerning AI-generated works and demands "further reflection on the protection of AI-generated content by intellectual property law."[136] EU individual member states have utilized differing methods, resulting in a splintered legal framework within the European common market. The United Kingdom has adopted a unique model by incorporating specific provisions for works generated by computers in its copyright act. The Copyright, Designs and Patents Act, 1988 contains that for computer-generated works "in situations in which there is no human author," the author is to be "the person by whom the arrangements necessary for the creation of the work are undertaken.[137]

China has pursued a broad approach towards protecting copyrights in works created by artificial intelligence. In a 2023 landmark ruling, the Beijing Internet Court ruled that a piece of content created through an AI system would be eligible for copyright protection with the right resting with the firm that invented and ran the system and this ruling is a testament to China's strategic focus on AI development and indicates a willingness to stretch traditional copyright norms to include advances in technology. [138]

These divergent approaches engender substantial legal uncertainty for creators and businesses active in a multiplicity of jurisdictions. Courts and policymakers in addressing these divergent approaches must reconcile the incentive functions of copyright with considerations of equity, innovation policy, and legal coherence. As AI systems are increasingly autonomous and advanced, the strain on traditional conceptions of authorship will only increase, perhaps requiring more explicit legislative action.[139] Under this chapter, next we will deal with a comparative analysis of copyright regimes.

[136] European Parliament, Resolution on Artificial Intelligence and Intellectual Property Rights, 2023/2681(Issued on 2023).
[137] Copyright, Designs and Patents Act, 1988, §9(3).
[138] Beijing Feilin Law Firm v. Baidu, Beijing Internet Court, Case No. (2023) Jing 0491 Min Chu No. 1201.
[139] Masood, *supra* note 116.

3.4 COMPARATIVE ANALYSIS OF COPYRIGHT REGIME

3.4.1 The United States Approach

The United States has one of the most restrictive methods of copyright protection for AI works, solidly grounding copyright protection in human authorship and is governed primarily by the Copyright Act of 1976. The U.S. Copyright Office's stance is based on both statutory construction and historical judicial tradition underscoring the human aspect of creativity.[140]

The Copyright Office published registration guidance specifically dealing with AI-generated works, affirming that the work is not copyrightable unless there is significant human creative input.[141] The guidance recognizes that human authors can reserve copyright in their creative input into AI-generated works, including the arrangement and selection of AI-generated material or the production of complex prompts that demonstrate sufficient originality. The Compendium of U.S. Copyright Office Practices, have stated that it will refuse to register a claim if it determines that a human being did not create the work and the Office has also indicated that works created by a machine or by any simple mechanical process which functions randomly or automatically without any creative input or intervention on the part of a human author cannot be protected by copyright.[142]

The U.S. system is based on the constitutional and statutory texts in which the protection of copyrights is attached to "Authors" and "Writings".[143] The Supreme Court observed in *Goldstein v. California*[144], the word "author" speaks of "an original creator, one who brings something into existence." This causal connection between human creativity and capable expression has been an ongoing thread throughout U.S. copyright jurisprudence.

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[140] U.S. Copyright Office, Copyright Registration Guidance: Works Containing Material Generated by Artificial Intelligence, 88 Fed. Reg. 16190 (Issued on 16/03/2023).
[141] U.S. Copyright Office, Copyright Registration Guidance: Works Containing Material Generated by Artificial Intelligence, 87 Fed. Reg. 12345. (Issued on 2022).
[142] U.S. Copyright Office, "Compendium of U.S. Copyright Office Practices," § 313.2 (3d ed.) (2024).
[143] U.S. Constitution, Art. I, § 8, cl. 8
[144] 412 U.S. 546, 561 (1973)

The notion as well as the approach taken by US with regard to the authorship concerns are mostly settled, but the application of the fair use doctrine does bring in complications for the copyright regime in the country. Recent cases have questioned the legitimacy of using copyrighted content as training material for artificial intelligence systems, contending that the use of copyrighted content is copyright infringement and not fair use. This concern will be addressed in the following chapter.

3.4.2 The European Union Approach

The European Union Copyright system, harmonized by a range of directives but is implemented by member state laws, shows that it is somewhat of a fragmented approach towards AI works. The original Copyright Directive (2001/29/EC) and the recent Directive on Copyright in the Digital Single Market (2019/790/EU) say nothing about AI authorship, even though both do so implicitly presuppose human creators.[145]

The EU's strategy on copyright protection has its basis on the ruling of the Court of Justice of the European Union ruling in the case of Infopaq[146]. The ruling was that copyright should be provided for work which has the intellectual creation of the author. This threshold focuses on the uniqueness of the human author in that it demands the work to express the personality and creative decisions of the author. This focus on individual expression raises conceptual hurdles to the protection of AI-created works under the EU regime. Without explicit legislative action, completely autonomous AI works can go beyond the scope of copyright protection in the majority of EU member states. Yet, works with meaningful human creative contribution—such as AI-co created works and works created with considerable human guidance can still be protected under prevailing norms.[147]

[145] European Union, Directive 2001/29/EC on the harmonisation of certain aspects of copyright and related rights in the information society, (Issued on 2001) ; European Union, Directive 2019/790/EU on copyright and related rights in the Digital Single Market, (Issued on 2019)
[146] Infopaq International A/S v. Danske Dagblades Forening, Case C-5/08, Court of Justice of the European Union (2009)
[147] Eleonora Rosati, Infringing AI: Liability for AI-generated outputs under international, EU, and UK copyright law, European Journal of Risk Regulation (2024).

The EU has identified the importance of providing more definitive guidance on AI and intellectual property. In its 2023 Artificial Intelligence Act, the European Commission accepted the need to address intellectual property concerns regarding AI but left particular copyright provisions to subsequent legislative actions.[148] The European Parliament's resolution regarding intellectual property rights for development of artificial intelligence technologies demanded a "balanced approach" that safeguards human ingenuity but enables technological advancement.[149]

The EU stance pertaining to authorship itself does harbor uncertainty since the member states have pursued both a lenient and a restrictive stance. The aspect of fair dealing, however, has been in the grey legal zone, which is necessarily giving way to copyright infringement. This diversity in the EU norms combined with the differential interpretation by member states does result in divergent methods.

3.4.3 The UK Approach

The United Kingdom has taken a unique approach to AI-generated works through particular statutory provisions. The Copyright, Designs and Patents Act 1988, Section 9(3) states that for a computer work "in situations in which there is no human author," the author is deemed to be "the person by whom the arrangements necessary for the creation of the work are initiated."[150] This provision antedates contemporary AI systems but possibly provides a basis for assigning authorship of AI-created works to human developers or operators. The UK solution is a practical one to the problem of authorship, so that computer-generated works are not automatically placed in the public domain.

The second concern that has arisen by the fast development of AI is the application of copyrighted material for training AI systems. In contrast to the American "fair use" rule, which provides a free, open-ended exception, the UK utilizes "fair dealing" exceptions—narrowly defined specific situations under which copyrighted work may

[148] European Commission, Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on Artificial Intelligence (Artificial Intelligence Act), COM 252 final (Issued on 2023).
[149] European Parliament, "Resolution on Intellectual Property Rights for the Development of Artificial Intelligence Technologies, 2023/2596(RSP) (Issued on 2023).
[150] Copyright, Designs and Patents Act, 1988, § 9(3).

be used without permission.[151] The recent technological advancements, applicable to AI has prompted the UK to introduce the text and data mining (TDM) exception, enacted in 2014 which allows copying of works for computational analysis for research purposes not for commercial gain.[152] This exception was later broadened in 2023 to cover commercial purposes but with an opt-out for rights holders.[153]

The UK's new TDM exception[154] has changed the legal framework substantially for training AI. The exception has the potential to offer a right to use copyrighted material in training sets without the need for rights holders' permission.[155] This differs from the EU position. Aside from this a number of ambiguities do remain as to why the TDM exceptions exist, primarily regarding computational analysis and whether the exception continues after the deployment of trained models. It is contended that whilst the approach of the UK is more innovation-friendly than in most jurisdictions, it does create extensive legal uncertainty for AI developers as to which training methodologies come within the scope of the exception.[156]

Recent news indicates possible change in the UK policy. The UK Intellectual Property Office (IPO) consulted in 2022 on AI and intellectual property and potential computer-generated works provision reforms.[157]

3.4.4 The Asian Countries Approach

Asian jurisdictions have gone through varied approaches towards AI-generated works, reflecting varied priorities for technological innovation and conventional copyright principles. It is quite interesting to learn the concerns around this concept. Japan and

[151] Rober Burrell & Allisson Coleman, Copyright Exceptions: The Digital Impact. (Cambridge University Press 2005).
[152] Intellectual Property Office (IPO), Exceptions to Copyright: Research, (Issued on October 2014).
[153] UK Government, Government response to consultation on artificial intelligence and intellectual property, (Issued on 2022).
[154] Copyright, Designs and Patents Act, 1988, § (29) (B)
[155] Intellectual Property Office (IPO), Artificial Intelligence and IP: copyright and related rights, (Issued on 2023).
[156] R Ducato & A Strowel, Limitations to Text and Data Mining and Consumer Empowerment: Making the Case for a Right to Machine Legibility. Vol 52 International Review of Intellectual Property and Competition Law (2019).
[157] UK Intellectual Property Office, "Artificial Intelligence and Intellectual Property: Copyright and Patents," (Issued on 2022).

China, have become prominent actors in AI development, taking different approaches to copyright protection of AI-generated works in their legal regimes.

Japan has been cautious in addressing AI authorship, keeping conventional requirements for human imagination in its copyright legislation. The Japanese Copyright Act safeguards "productions in which thoughts or sentiments are articulated in a creative manner"[158] language that has been interpreted to demand human authorship. Yet Japan actively sought possibilities of reform through its Next Generation Intellectual Property System Committee, which has weighed up a range of possibilities for safeguarding AI-created works beyond the conventional copyright regime.[159] On the other hand, China is at the forefront of incorporating copyright law to include AI-created works. In a landmark decision, the Beijing Internet Court ruled that a piece of content created using an AI system might be given copyright protection, with ownership in the company that developed and ran the system and the notion behind the court's decision was that the company's choice of training data, the design of algorithms, and parameter specification represented adequate creative contribution to grant authorship rights.[160] China is actively seeking to encourage investment in AI technologies and capture the global leadership position in world markets and this decision is precisely in line with its national AI strategy.[161] This broad-based approach has been attacked as it fails to deal adequately with the core principles of copyright, human creativity and originality.[162]

The different approaches adopted by the countries does pave the way to further complications, especially with Chinese courts looking into training data and design of algorithms for determining originality.

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[158] Copyright Act of Japan, Act No. 48 of 1970, Art. 2(1)(i)
[159] Ministry of Economy, Trade and Industry, "Report on Intellectual Property System for AI-Generated Works," Next Generation Intellectual Property System Committee (2023).
[160] Beijing Feilin Law Firm v. Baidu, Beijing Internet Court, Case No. (2023) Jing 0491 Min Chu No. 1201
[161] State Council of China, "New Generation Artificial Intelligence Development Plan," State Council Document No. 35, (Issued on 2023).
[162] H Wang, Authorship of Artificial Intelligence-Generated Works and Possible System Improvement in China, Beijing Law Review (2023).

3.4.5 The Indian Approach

The Indian Copyright Act, 1957 was developed during the pre-digital period, and even though later amendments dealt with digital technologies, there is still considerable uncertainty about its applicability to AI systems. The Indian Copyright Act offers copyright for "original literary, dramatic, musical and artistic works".[163] Two basic prerequisites to copyright protection are originality and human authorship, although the latter is implicit and not expressed in the Act[164]. Section 2(d) of the Act adopts the term "author" in relation to different kinds of works in a consistent sense referring to individuals creating or producing the work. In India, where the digital economy is growing at tremendous rate with AI development efforts, the application of current copyright legislation to AI systems poses significant legal issues.[165] The UK Copyright, Designs and Patents Act 1988 which has explicit provisions for computer-generated works, the Indian Copyright Act does have scope for dealing with computer generated works, but the Indian legal regime does not clearly provide guidance on non-human authorship.[166] This leaves substantial doubt concerning the protectability of works where AI systems aid human authors or create content independently.

In contrast to the US "fair use" doctrine, which is flexible in its application, Indian law has a "fair dealing" system with enumerated exceptions. Section 52 of the Indian Copyright Act gives limited exceptions when copyright infringement does not take place, such as fair dealing for private or personal use, including research, criticism or review and reporting current events. It is seen that this provision significantly does not include express exceptions for computational analysis, text and data mining, or machine learning purposes. AI systems, especially machine learning models, need massive amounts of data to be trained. When such data comprise copyrighted material, there are doubts as to whether use in this manner amounts to copyright infringement or is covered by fair dealing exceptions.

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[163] Copyright Act, 1957, §13.

[164] Sik Cheng Peng, Artificial intelligence and copyright: The authorship conundrum WIPO-WTO Colloquium Papers (2018).

[165] Ana Ramalho, Will robots rule the artistic world? A proposed model for the legal status of creations by artificial intelligence systems, Maastricht University (2017).

[166] Andres Guadamuz, Do Androids Dream of Electric Copyright? Comparative Analysis of Originality in Artificial Intelligence Generated Works, Intellectual Property Quarterly (2017).

Nonetheless, new policy debates, such as the National Strategy for Artificial Intelligence, have underscored the necessity of legal clarity about AI-generated content[167] and the Indian courts should also interpret these provisions in the context of sophisticated AI systems with autonomous generation capabilities.

3.5 REGULATORY GAPS AND INCONSISTENCIES

3.5.1 Cross – Border Enforcement Challenges

The global spread of AI research and deployment generates substantial cross-border enforcement difficulties for copyright protection. Where AI-generated works and AI systems themselves cross borders, the heterogeneity and sometimes conflicting legal responses addressed above create a complicated regime of enforcement.

Territorial boundaries of copyright law raise core challenges in this regard. Protection by copyright continues to be mainly territorial even with attempts at international harmonization, and each country has its own standard for protection, exceptions, and enforcement measures.[168] This territoriality presents special challenges for AI-created works, which can be protected in some states but not others and thus create potential "protection gaps" within international markets. The dispersed character of AI development transcends conventional territorial borders, necessitating innovative solutions to private international law in intellectual property disputes. Issues regarding jurisdiction, law applicable, and enforcement of foreign judgments are particularly complicated when addressing AI systems that might be created in one jurisdiction, trained on data from a variety of countries, and deployed globally.[169] The issue of jurisdiction shopping becomes a major issue in this pluralized legal environment.

Enforcement mechanisms targeted at conventional copyright violation could be inappropriate to fight AI-related infringement. The technical intricacy of AI systems can complicate detection infringement, link causation from particular training materials

[167] NITI Aayog, India's National Strategy for Artificial Intelligence, (Issued in June 2018).
[168] J Ginsburg & E Treppoz, International Copyright Law: U.S. and E.U. Perspectives, (Edward Elgar Publishing 2015).
[169] Oren Bracha, The Work Of Copyright In The Age Of Machine Production, Vol 38 Harvard Journal of Law & Technology, (2024).

to results, and propose appropriate remedies. Furthermore, the players at stake in any alleged infringements—AI system developers, operators, or end-users—can be based in alternative jurisdictions, complicating enforcement attempts. Technical enforcement systems also struggle immensely with the cross-border environment. Digital rights management systems and technical protection measures can be worked around or made useless when content traverses across jurisdictional borders with varying standards of legal protection.[170] Cross-border mechanisms for international cooperation are underdeveloped to deal with these cross-border issues. Although current treaties like the Berne Convention and TRIPS Agreement have minimum standards for copyright protection, they neither treat AI-specific issues nor formulate sound enforcement mechanisms for cross-border disputes over AI-generated works.[171]

3.5.2 Barriers to International Trade.

The convergent copyright treatments to AI works pose potential impediments to global trade in AI services and technologies. These differences have the potential to distort international market competition, complicate cross-border transactions and may infringe international trade commitments. The relationship between trade and IPR have been established in the previous chapter.

Trade in AI-created content is especially challenged in this fragmented legal landscape. Content created by AI tools can be protected legally in some markets but not in others, and this creates uncertainty for companies looking to market such content overseas.[172] This uncertainty could discourage investment in AI technologies and curtail the economic potential of AI innovation. The lack of clear international norms on AI-generated products poses a potential conflict with the non-discrimination values constituting the WTO regime.[173] Current trade agreements have more and more incorporated provisions regarding digital trade and intellectual property protection but

[170] Jerome Reichman, Graeme Dinwoodie et al., A Reverse Notice and Takedown Regime to Enable Public Interest Uses of Technically Protected Copyrighted Works, Vol 38 *Berkeley Technology Law Journal* (2007).
[171] Anthony Man-Cho So, Feroz Ali et al., Artificial Intelligence and Intellectual Property, (Jyh-An Lee, Reto Hilty et al. (eds) 2021).
[172] *ibid*
[173] Shlomit Yanisky-Ravid, Generating Rembrandt: Artificial Intelligence, Accountability and Copyright, *Michigan State Law Review* (2018).

with unclear implications for AI. Both the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the United States-Mexico-Canada Agreement (USMCA) have digital trade and intellectual property provisions affecting AI development, but neither of them has provisions dealing with AI authorship or copyright protection of AI-generated works.[174]

Differential treatment of AI systems by states can potentially amount to non-tariff barriers to trade. The jurisdictional disputes can pose potential WTO challenges. One member state can potentially contend that another member's copyright strategy towards AI represents an unwarranted limitation on trade in services under the General Agreement on Trade in Services (GATS) or offends national treatment commitments in the TRIPS Agreement. These kinds of challenges would have to contend with the intricate interaction between intellectual property protection and trade obligations, including flexibilities and limitations embedded within these agreements.

3.6 HARMONIZATION AND EMERGING APPROACHES

The fragmented legal framework has created many challenges and has led to several attempts at harmonization at the international and regional levels. These attempts hope to create synergistic frameworks for responding to copyright issues surrounding AI, but they are beset with enormous challenges.

WIPO has spearheaded international debate on AI and intellectual property with its Conversation on IP and AI, initiated in 2019.[175] The platform has opened up dialogue among member states, industry, and academic experts on issues such as copyright protection for works produced by AI, exceptions to text and data mining, and copyright infringement liability involving AI systems. Although such debates have raised the level of awareness on the issues, they have not yet led to specific suggestions for international standards or agreements. WIPO's Standing Committee on Copyright and Related Rights (SCCR) has started dealing with AI-related matters in its general work agenda. The committee discussed, during its 42nd session in 2022, the possibility of

[174] Comprehensive and Progressive Agreement for Trans-Pacific Partnership, Chapter 18 (Intellectual Property); United States-Mexico-Canada Agreement, Chapter 20 (Intellectual Property).
[175] World Intellectual Property Organization, WIPO Conversation on Intellectual Property and Artificial Intelligence, WIPO/IP/AI/3/GE/23/INF/4 (Issued on May 2020).

adding to its agenda for future sessions copyright issues pertaining to AI, although no concrete decision has been made.[176] TRIPS obliges member countries to ensure effective enforcement mechanisms for intellectual property rights, which might well be used for rights in works created by AI in which such rights exist.

The European Union's draft Artificial Intelligence Act is one of the most systematic regulatory reactions to AI technology anywhere in the world, and it has broad implications for copyright protection of works created by AI.[177] While generally concerned with risk management and consumer protection, the AI Act includes provisions that indirectly influence copyright considerations. The documentation and data governance requirements of the Act also have implications for copyright in AI training. Those developing high-risk AI systems must keep detailed records on the data used for testing and training them, along with details on their provenance and characteristics. These demands can secondarily encourage stricter copyright compliance in the collection and utilization of training datasets.[178]

The United States has responded to AI copyright questions with a mix of administrative direction, case law establishment, and proposed legislation, consistent with the multi-faceted U.S. system approach towards legal development.[179] The U.S. Copyright Office has also been at the forefront in dealing with copyright issues regarding AI-created works. In February 2023, the Office published guidance on copyright registration of works featuring AI-created content, reiterating its stance that only copyright protection is available for human-authored components.[180] This directive explained that candidates need to reveal AI participation in the development process and specify the particular components authored by humans to be submitted for registration.

Japan has adopted some of the most progressive policy positions on AI and copyright. They have included possible sui generis protection regimes for works generated by AI

[176] World Intellectual Property Organization, Report of the Standing Committee on Copyright and Related Rights, Forty-Second Session, SCCR/42/6 (Issued on 2022)
[177] European Parliament, EU AI Act: first regulation on artificial intelligence (8th June 2023)
[178] Magdalena Serafin, The EU AI Act and copyrights compliance, iapp (30th April 2025) https://iapp.org/news/a/the-eu-ai-act-and-copyrights-compliance
[179] Copyright Registration Guidance: Works Containing Material Generated by Artificial Intelligence, National Archives Federal Register 88 FR 16190
[180] Federal Register Version, 88 Fed. Reg. 16,190 (Mar. 16, 2023)

that would grant limited rights without human authorship. On the other hand, international trade agreements have increasingly dealt with digital trade and intellectual property concerns, although direct treatment of copyright issues related to AI is still scarce. These agreements establish frameworks that shape the way nations treat copyright protection for AI-generated works in international business.

Substantial barriers to more extensive harmonization exist. Philosophical disagreements over the nature and aim of copyright protection give rise to profound differences between jurisdictions.[181] Countries that place a premium on utilitarian rationales for copyright might be more inclined to modify established doctrines to encompass AI innovation, whereas those with more robust natural rights or personality-based customs might object to deviations from human-focused authorship modes. Economic interests also pose barriers to harmonization. Countries with established technology industries and high stakes in AI research might prefer legal approaches that enable AI development and deployment, while others with more developed creative industries would want to safeguard human creators against possible competition from AI systems. These conflicting economic interests make consensus positions on major issues difficult to develop. Technical subtleties of AI systems also pose difficulties for harmonization. Because AI technologies advance very quickly, legal systems find it hard to catch up, and international harmonization efforts usually have much longer timescales than technological innovation.[182] This mismatch in time puts danger on the potential that harmonized standards could be made obsolete before they are completely adopted.

3.7 CONCLUSION

This chapter has ventured into a sophisticated legal landscape where AI intersects with copyright laws across various jurisdictions. The analysis identifies numerous observations that point out both the overarching challenges of adopting conventional

[181] P Goldstein & P B Hugenholtz, International Copyright: Principles, Law, and Practice, (4th ed., Oxford University Press, 2019).
[182] Daniel L Burk, Algorithmic Fair Use, Vol 86 University of Chicago Law Review (2019).

copyright norms to AI technologies as well as the specific shortcomings within particular legal systems, in this case, India's copyright legal system.

The underlying conflict between copyright law's traditionally human-oriented understanding of authorship and the continuously growing autonomous creative potential of AI systems presents a key challenge globally. Although jurisdictions such as the United States, European Union, and United Kingdom have initiated addressing these issues through judicial decision-making, legislation, and policy-making, considerable regulatory gaps remain. The comparative analysis illustrates that legal systems are developing at widely disparate rates, forming an uneven global landscape that hinders cross-border enforcement and international trade in content produced by AI. These jurisdictional challenges do pose potential obstacles to cross-border trade in AI technologies and AI-generated content. Works that are protected in one jurisdiction might not be protected in another, leading to legal uncertainty that can discourage cross-border transactions and investment. In addition, different approaches to exceptions and limitations—especially to text and data mining—can deter AI systems created in one jurisdiction to law operating fully elsewhere with more prohibitive regimes. Additionally, while countries such as Japan and China have specifically provided special provisions for machine-learning uses of copyrighted materials for training, India is devoid of clarity regarding whether such uses are an infringement or an exception. This legal uncertainty presents specific hurdles for researchers and developers who need regulatory clarity to further AI capabilities while being sensitive to intellectual property rights.

India's copyright regime is particularly underdeveloped to deal with AI challenges. Unlike the EU's targeted policy approaches or the UK's explicit provisions for computer-generated works, Indian copyright law remains anchored in traditional conceptions of human authorship that leave AI-generated works in a legal vacuum. The Copyright Act of 1957, despite amendments in 2012, fails to recognize the unique characteristics of AI systems as potential creators. This regulation by inertia causes large legal uncertainty to India's expanding AI sector, and this could vitiate innovation and put Indian developers at a disadvantage globally.

The efforts at harmonization elaborated in this chapter, as promising as they are, are hindered by great challenges emanating from different philosophical assumptions towards the protection of copyrights and different economic interests across countries. India's engagement with these global efforts at harmonization has been very passive, restricting its ability to influence global standards that could eventually affect domestic industries in the country.

As we move to the discussion of fair dealing and algorithmic collusion in Chapter IV, the weaknesses of India's copyright system become all the more relevant. The fair dealing provisions in Indian law, typically constricted in scope and application, are confronted with an unprecedented dilemma when they are applied to AI systems capable of analyzing, learning from, and replicating large amounts of covered work. The idea of algorithmic collusion, where AI systems may develop independently strategies that mimic anti-competitive tactics, is further muddying the waters, especially in countries such as India where competition law and copyright convergences are untested.

The following chapter will expand on these gaps established by considering the ways in which fair dealing doctrines in various jurisdictions are evolving in response to AI technologies, specifically in the Indian context. It will examine how algorithmic decision-making in AI systems can inadvertently bypass conventional copyright constraints and exceptions, producing new types of market concentration that Indian regulatory systems are presently ill-prepared to handle. It will further shed light on the imperative for overall legal reforms that will balance incentives to innovate with safeguarding creators' rights within the fast-changing environment of AI.

CHAPTER 4

FAIR DEALING AND ADDRESSING ALGORITHMIC COLLUSION WITH REGARD TO INDIAN COPYRIGHT REGIME.

4.1 INTRODUCTION

The advent of artificial intelligence has practically questioned the traditional intellectual property paradigms, especially of Copyright law, as it was imagined at a time when human creation was the only source of creative work. As generative AI continues to evolve, it presents deep questions about the use of copyright doctrine, particularly in relation to the enormous amounts of data necessary for training such systems and their potential for autonomous algorithmic acts that could be intellectual property infringement.[183] This chapter discusses two significant aspects of this new terrain in the Indian copyright system: the use of fair dealing exceptions to AI training procedures and the new issue of algorithmic collusion in intellectual property issues.

The importance of training data cannot be exaggerated in the AI environment. It is actually the 'fuel' that drives AI models, allowing them to learn, reason, and produce outputs. Without the availability of large and varied datasets, the revolutionary potential of AI would largely go unrealized. This critical necessity for data, however, squarely conflicts with the interests of copyright owners. The activity of 'ingesting' or 'scraping' copyrighted content for training is what is posing the essential questions of whether such conduct constitutes infringement, whether it is exempted under fair dealing exceptions,[184] and who is responsible for potential infringements contained within the output of the AI.

Fair dealing, an exception of foundation in all copyright laws globally, allows for limited use of copyrighted works without the permission of the rights holders in certain cases. Section 52 of the Copyright Act, 1957 of India sets out these exceptions, but its

[183] Kate Crawford, Roel Dobbe et.al, The A.I. Now Report 2019, A.I. Now (2019).
[184] Thomas Heldrup, Report on Pirated Content Used in the Training of Generative AI, RIGHTS ALLIANCE 5–6 (2025)

application to AI systems that consume huge amounts of protected works raises new challenges. In contrast to the conventional human interaction with copyrighted works, AI systems handle works on unimagined scale and through processes entirely alien to human understanding. This chapter examines whether and to what extent India's fair dealing provisions adapt to these technological advances, especially in comparison to other jurisdictions that have set about answering such questions with more directness.

AI is broadly defined as "an algorithm or machine capable of completing tasks that would otherwise require cognition.[185] Algorithms, particularly those used in deep learning systems, can self-improve and automate their own refinement and during the training process, these algorithms are fed large amounts of data, allowing them to adjust their internal parameters, known as weights, to improve their output's match with desired results.[186] The technology is advancing at an unprecedented rate, making it difficult to predict its future trajectory and potential consequences.[187] While debates surrounding algorithmic collusion have taken place mainly within competition law settings, relating to price-fixing or market manipulation by self-acting algorithms, such concerns equally apply in the intellectual property setting. Artificial intelligence systems, especially those that use reinforcement learning algorithms,[188] can autonomously create methods that evade copyright protection, systematically appropriate copyrighted expressions, or enable mass infringement without direct human control. The Indian legal framework, like most in the world, is severely challenged to deal with these unprecedented styles of possible IP infringement that transgress conventional lines of intent, agency, and responsibility.

This chapter attempts to wade through these intricate crossroads of law and technology, assessing the sufficiency of India's copyright system in meeting AI-related concerns while making isolated comparisons with global practices. By investigating fair dealing exceptions and algorithmic collusion in the specific situation of India's emerging legal architecture for technological regulation, this analysis is part of the overall body of

[185] Ryan Abbott & Elizabeth Rothman, Disrupting Creativity: Copyright Law in the Age of Generative Artificial Intelligence, 75 FLA. L. REV. 1141, 1146 (2023).
[186] *Id.*
[187] Matthew U. Scherer, Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies, 29 HARV.J.L. & TECH. 353, 366 (2016).
[188] Dennis D. Crouch, Using Intellectual Property to Regulate Artificial Intelligence, Vol 89 Missouri Law Review (2024).

knowledge about how established intellectual property principles need to adapt to artificial intelligence. The ultimate goal is to determine the ways toward a balanced strategy that maintains incentives for human imagination and accommodation for technological progress in the fast-moving environment of AI.

4.2 FAIR DEALING AND AI TRAINING DATA IN INDIA

4.2.1 Conceptual Framework of Fair Dealing

Fair dealing is an important restriction on the monopoly rights granted by copyright protection, allowing certain uses of copyrighted works without the permission of rights holders in particular situations. In India, the doctrine of fair dealing is enshrined statutorily in Section 52 of the Copyright Act, 1957, as an all-encompassing list of acts which fall short of infringement.[189] The approach is considerably different from the more accommodating "fair use" doctrine available in some jurisdictions like the United States, given India's following the British tradition of specifically stated exceptions and not a general principle-based limitation.[190] The Copyright Act clearly allows for fair dealing with literary, dramatic, musical, or artistic works for the purposes of: (i) private or personal use, such as research; (ii) criticism or review; and (iii) current events reporting and current affairs reporting.[191] The Act does not provide any definition of "fair dealing," however, leaving this to the judicial mind on an ad hoc basis and the Supreme Court of India and some High Courts have increasingly evolved criteria of evaluation by case law, developing a jurisprudential framework for determining fairness across situations.[192]

In the landmark case of *R.G. Anand v. Delux Films*[193], the Supreme Court highlighted that copyright protection is only for the expression of ideas and not the ideas themselves. These fundamental interpretations have later aided in the formation of fair dealing, especially where transformative or derivative uses are concerned. The Delhi

[189] The Copyright Act, 1957, § 52.
[190] Shamnad Basheer, The "Fair Deal" in Copyright Law: An Indian Perspective, 13 J. INTELL. PROP. RTS. 357, 359-360 (2018).
[191] The Copyright Act, 1957, § 52(1)(a).
[192] Justice (Retd.) Pradeep Nandrajog, Judicial Interpretation of Fair Dealing in India: Evolving Standards, 26 NLSIU L. REV. 42, 47-50 (2022).
[193] AIR 1978 SC 1613

High Court, in *Chancellor Masters & Scholars of University of Oxford v. Narendra Publishing House*[194], went further to sharpen the analytical process by employing a four-factor test similar to American fair use jurisprudence: (1) the character and purpose of the use; (2) the nature of the copyrighted work; (3) the substantiality of the part used; and (4) the impact on the potential market for the copyrighted work.

The 2012 amendments to the Copyright Act set out various provisions dealing with technological measures and digital rights management, which demonstrate India's attempts to modernize its copyright law in the wake of digital technologies.[195] The amendments widened the ambit of fair dealing to cover works stored in electronic form for certain non-commercial purposes and added special provisions for technological protection measures. The amendments were silent on algorithmic or automated uses of copyrighted works for the purposes of machine learning, leading to a huge amount of uncertainty in the application of fair dealing exceptions to AI training processes.[196] This legislative void takes on special importance in the context of AI, where the consumption of copyrighted material is at scales unprecedented and through vectors that fundamentally depart from patterns of human consumption envisioned by the initial fair dealing provisions.[197]

The legislative gap has been sought to be addressed by judicial interpretation, but has not yielded great results. In *Syndicate of The Press of The University of Cambridge v. B. D. Bhandari & Anr* [198], it was held by the Delhi High Court in 2012, relating to photocopying of copyright textbooks by a copy shop from inside Delhi University for students. Although mainly dealing with the educational exception under Section 52(1)(i), it dealt briefly with the general principles of fair dealing and public interest. The ruling highlighted the social welfare aims of the Indian copyright regime, weighing publisher interests against the educational interests of students. Although not strictly

[194] Chancellor Masters & Scholars of University of Oxford v. Narendra Publishing House, 2008 (38) PTC 385 (Del) (India).
[195] The Copyright (Amendment) Act, 2012, No. 27, Acts of Parliament, 2012 (India)
[196] T.C. James & Swaraj Paul Barooah, Copyright Reform in the Digital Era: Analyzing the 2012 Amendments Through a Technological Lens, 19 J. INTELL. PROP. RTS. 107, 112-115 (2021).
[197] Arul George Scaria & Rishika Rangarajan, Fine-Tuning the Intellectual Property Approaches to Artificial Intelligence: Examining Fair Dealing in the Context of Machine Learning, 28 IND. J.L. & TECH. 73, 78-80 (2023).
[198] 185 (2011) DLT 346

about transformative use for commercial AI, the case does reflect the judiciary's readiness to construe exceptions liberally in support of socially useful activity, which AI lobbyists could claim entails technological innovation.

Another ongoing development in India that is directly related to AI and copyright. Although still in the early stages of proceedings before the Delhi High Court, the action allegedly concerns allegations by ANI Media, a leading Indian news agency, that OpenAI (ChatGPT's developer) has pirated its copyright by incorporating its news coverage into training its large language models without permission or compensation.[199] The decision in this case will be instrumental in determining the application of fair dealing to AI training data in India. It is likely to push the limits of "research" and "private or personal use" under Section 52(1)(a)(i) in the context of big commercial AI undertakings.[200] It will also cause to deal with important questions such as whether scraping large volumes of copyrighted news pieces for commercial training of AI falls under "research" or "private use and whether the act of training an LLM is "transformative" enough to trump copyright infringement, or if it just amounts to unauthorized reproduction for profit.[201]

4.2.2 AI Training Data and Fair Dealing

The creation of complex AI models requires ingestion of enormous volumes of data, frequently copyrighted works of varying types such as literary works and works of art, software code, and scholarly works. Mass-scale use of such protected works involves a number of unique challenges to the application of conventional doctrines of fair dealing under Indian copyright law.

First, the vast magnitude of use fundamentally varies from traditional fair dealing situations. Whereas typical applications usually consist of brief fragments of single works, machine learning typically entails duplicating full works on a wide variety of different media types often involving millions of copyrighted works at once. Indian

[199] Ani Media Pvt Ltd v. Open Ai Inc & Anr., CS(COMM) 1028/2024.
[200] Vaishali Mittal, ANI v OpenAI: A copyright, AI training and false attribution dispute, Asia Business Law Journal (2024.)
[201] Audrey Pope, NYT v. OpenAI: The Times's About-Face, Harvard Law Review (2024).

copyright law does not contain any express quantitative benchmarks for fair dealing, which has raised doubt as to whether such widespread appropriation can feasibly constitute "fair" under even the most liberal reading of Section 52.[202] The fact AI models tend to consume entire copyrighted works – entire books, entire articles, entire images. Whereas the AI doesn't "store" them in a readable form, the position that it only utilizes "insubstantial portions" is hard to maintain where whole datasets are consumed.[203]The "black box" nature of AI makes it hard for copyright owners to establish precisely what parts were utilized or internalized.[48] The argument then becomes "how much was accessed and processed" rather than "how much was copied," to which traditional copyright law isn't well-suited to directly respond.

Second, the commercial purpose of most AI systems makes it difficult to undertake fair dealing analysis under Indian law. Section 52(1)(a)(i) allows fair dealing for "private or personal use, including research," but most modern AI systems are created by profit-oriented firms with profit-making uses. The Delhi High Court in India *TV Independent News Service Pvt. Ltd. v. Yashraj Films Pvt. Ltd*.[204] indicated that commercial exploitation is against the determination of fair dealing, although it clarified that commerciality in itself is not determinative. With significant commercial investment powering the growth of AI in India and worldwide, the research exception may be progressively challenging to raise.

Third, the potentially transformative character of the use of AI poses interpretive difficulties. When copyrighted materials are used to train AI, the outputs of AI will often bear little similarity to the original works and could lend themselves to arguments of transformative use. Yet Indian law has not to a great extent built upon transformative use doctrine compared to American fair use law. The ruling in *Civic Chandran v. Ammini Amma*[205] acknowledged the possible validity of creative changes but offered scant information on systematic, algorithmic changes typical of AI systems. In this regard, the court has taken into account the scope of the verbatim copying and purpose of its taking, probability of competition between the two works for the purpose of

[202] Zakir Thomas, Overview of Changes to the Indian Copyright Law, 17 J. INTELL. PROP. RTS. 324, 326-328 (2012).
[203] V K Ahuja, Artificial Intelligence and Copyright: Issues and Challenges, ILI Law Review (2020).
[204] 2013 (53) PTC 586 (Del)
[205] 1996 PTC (16) 670 (Ker)

understanding the effect in the market, user's motive and transformative character of the work. In the AI context, proponents do argue that the training of an AI model on copyrighted content is by nature transformative.[206] They argue that AI models do not copy the original works in a human perceivable format but instead derive patterns, correlations, and statistical relationships from the data. The following "transformative" argument can be disputed, particularly in the generative case. They contend that if the output of the AI is significantly identical with or duplicates aspects of copyrighted training material, or if it can create new work in the unique style of an author whose books were employed in training, then the process of training makes no difficulty in infringement feasible and economically the reality is the AI model is constructed on the "back" of original creators, with possible replacement of the market for their work without payment.[207] Although Authors Guild v. Google[208] upholds the concept that large-scale digitization for analysis can be transformative, its explicit relevance to generative AI is disputed. Google Books gave access to snippets of existing works; generative AI generates new works. The fundamental distinction lies in whether the AI's "transformation" results in a non-replaceable analytical tool (such as Google Books) or a substitute, directly competing creative work (such as ChatGPT producing a novel). Indian courts would perhaps deem this distinction important when adjudicating the ANI Media v. OpenAI case, specifically regarding the market effect on original content.

A fourth challenge relates to the lack of explicit text and data mining exceptions under Indian copyright legislation. Compared to jurisdictions like the European Union, which has provided for specific exceptions to text and data mining through the Digital Single Market Directive, India has no statutory provisions explicitly catering to computational examination of copyrighted material.[209] Such lack generates important uncertainty for developers of AI and researchers who carry out text and data mining operations crucial to AI development.[210]

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[206] Mathew Sag & Peter K Yu, The Globalization of Copyright Exceptions for AI Training, Vol 74 Emory Law Journal (2025).
[207] Bryan H Choi, AI Malpractice, DePaul Law Review (2024).
[208] 804 F.3d 202
[209] European Parliament , Directive (EU) 2019/790 of the European Parliament and of the Council on Copyright and Related Rights in the Digital Single Market, arts. O.J. (L 130) 92 (Issued on April 3rd 2019)
[210] Shamnad Basheer & Pankhuri Agarwal, India’s New IP Policy: A Bare Act?, Vol 13 Indian Journal

Lastly, market impact determination—a vital component of fair dealing determination—grows even more complicated in the AI setting. In *Blackwood & Sons Ltd. v. A.N. Parasuraman*[211], the court underscored that uses significantly impacting the market for the original work cannot amount to fair dealing. AI systems can both supplement existing markets by offering new uses for copyrighted works and potentially displace human-generated works in some situations, raising subtle market impact concerns not readily resolved under existing doctrinal paradigms.[212] This argument of market substitution is a chief concern of content industries and is at the heart of current cases all over the world[213] and this may also be the source of the "indirect effect" argument: even if the AI product does not compete directly, the taking of copyrighted works without permission to train them deprives rights holders of prospective licensing income from the thriving AI industry and thereby impacts the value of their work.[214]

One inherent challenge in implementing fair dealing with respect to AI training data is the "black box" design of most sophisticated AI models, especially deep neural networks.[215] It is frequently difficult, if not impossible, to determine exactly which copyright materials from the training dataset contributed to a particular output and how.[216] This opacity imposes heavy evidentiary burdens on copyright owners alleging infringement. It is challenging to establish the use without knowledge of what data was utilized in training, it becomes challenging for a copyright owner to convincingly establish that their particular work was part of the training dataset, let alone that its use resulted in an infringing output.[217] Tracing infringement would be another challenge, even where a work is known to be part of the training data, tracing a causal connection

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of Law and Technology, (2017).

[211] AIR 1959 MAD 410

[212] Arul George Scaria, Does India Need Digital Rights Management Provisions or Better Digital Business Management Strategies*?*, 10 J. INTELL. PROP. RTS. 53, 57-60 (2010).

[213] Daniel J. Gervais, Comment submitted by Professor Daniel Gervais, Vanderbilt Law Research Paper (2023).

[214] The New York Times Company v. Microsoft Corporation et al, No. 1:2023cv11195 - Document 514 (S.D.N.Y. 2025)

[215] Frank Pasquale, The Black Box Society, (Harvard University Press, 2015).

[216] Ariel Ezrachi & Maurice E. Stucke, AI and Collusion: When Computer Inhibit Competition, University of Illinois Law Review, (2017).

[217] Robin Feldman, Artificial Intelligence and Cracks in the Foundation of Intellectual Property, UC Law Research Paper, (2024).

between its ingestion and a potentially infringing AI output is a sophisticated technical and legal challenge[218] and such transparency holds back a strong fair dealing analysis, where factors such as "amount and substantiality of portion used[219]" or "nature of the copyrighted work" or "market impact"[220] are difficult to determine without insight into the training process and data as they use millions and billions for training purposes.[221]

This transparency gap results in calls for regulatory action, such as requiring disclosure requirements of training data, which could enable copyright enforcement and fair dealing determinations.

4.2.3 Comparative Analysis: Approaches to AI Training Data and Copyright Exceptions in Other Jurisdictions

The comparative legal analysis has been already done in the previous chapter, therefore a very brief summary regarding the approaches adopted by various jurisdictions in this matter would be done.

The United States system employs the flexible and open-ended 'fair use' doctrine, enacted in Section 107 of the Copyright Act of 1976.[222] Fair use is established by a four-factor test, a guideline and not a hard rule. It encompasses purpose and character of use, such as whether or not such use is for commercial or for non-profit educational purposes, the nature of the copyrighted work, the amount and substantiality of the part used in consideration of the copyrighted work as a whole and the impact of the use upon the potential market for or value of the copyrighted work.[223] The 'transformative use' doctrine, as developed by the Supreme Court in *Campbell v. Acuff-Rose Music, Inc*.[224] has been at the centre of fair use assessments, even in online environments such as

[218] WIPO, Generative AI Navigating Intellectual Property, IP and Frontier Technologies (2024).
[219] Harper & Row, Publishers, Inc. v. Nation Enters., 471 U.S. 539, 565 (1985).
[220] Andy Warhol Found. for the Visual Arts, Inc. v. Goldsmith, 598 U.S. 508, 547 n.21 (2023)
[221] IBM Initial Comments at 3. Stable Diffusion reported that their image generation model "was pre-trained on a filtered subset of two billion image and caption pairs." Stable Diffusion Initial Comments at 10.; Max Pumperla & Marwin, Processing 2 Billion Images for Stable Diffusion Model Training - Definitive Guides with Ray Series, Anyscale (14th May 2024).
[222] 17 U.S.C. § 107
[223] Harvard University Office of the General Counsel, Copyright and Fair Use: A Guide for Harvard Community, (2023)
[224] 114 S. Ct. 1164

Authors Guild v. Google, Inc.[225] The American approach, with its lenient fair use policy, grants courts a high degree of flexibility but at the same time leaves much legal uncertainty.

Conversely, however, if we take into consideration the European Union regime, the EU has taken a more forward-looking legislative policy on fair use by implementing TDM exceptions, making specific exceptions under the Directive on Copyright in the Digital Single Market (EUCDSM) 2019/790.[226] This directive tries to supply legal certainty for developers of AI while protecting the right of creators. Article 3 (TDM for the purposes of scientific research): This exception allows reproduction and extraction of legally available works for TDM by cultural institutions and research organizations, for the purposes of scientific research. Rights holders cannot opt out of this exception. Article 4 (TDM for Other Purposes): This general exception permits TDM of lawfully available works for any purpose (including for commercial purposes), subject to the condition that rights holders can "opt-out" of such use. Rights holders may reserve their TDM rights expressly, for instance, through terms of use or machine-readable technologies.[227] The EU legislation introduces legislative clarity providing a more lucid framework than the sole resort to judicial interpretation of fair dealing provisions currently in place, especially for commercial AI training.

UK have tended to favour granting wider TDM for commercial use but with a strong emphasis on ensuring rights holder control, possibly through a licensing or compensation mechanism. This is extremely needed.[228]

For India, deployment of AI training for commercial purposes solely under the generic "research" exception under Section 52 can result in considerable legal uncertainty, as seen in the case of ANI Media v. OpenAI. Taking into account certain TDM exceptions, as in the EU model but nuanced to suit the socio-economic and technological environment of India, would bring much welcome clarity.

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[225] 804 F.3d 202

[226] EU, *supra* note 22.

[227] Thomas Margoni & Martin Kretschmer, A Deeper Look into the EU Text and Data Mining Exceptions: Harmonisation, Data Ownership, and the Future of Technology, Volume 71 GRUR International, (2022).

[228] UK Government, Consultation on artificial intelligence and intellectual property: copyright and designs, (Oct. 29, 2021),

4.3 ALGORITHMIC COLLUSION

Whereas fair dealing discourse mostly centers on the input to AI (training data), the output and interactive behavior of AI systems pose an additional complicated issue: algorithmic collusion. Much debated in the context of competition law, algorithmic collusion describes situations where algorithms, by virtue of their autonomous learning and interactions, result in coordinated market phenomena in the absence of any explicit human intention to collude.[229] When such outcomes entail the production, distribution, or valuation of intellectual property, they can evolve into new forms of IP infringement, which present high risks for traditional legal frameworks, particularly in the context of India.

4.3.1 What are Algorithms?

An algorithm is a detailed, sequential set of rules that are applied in a certain order to generate a certain task. Algorithms are a type of logic that produces output and can be found in everything from solving mathematical problems to cooking recipes and composing music.[230] As computer technology advanced, algorithms started to take shape. Today, they are used in sophisticated calculations that would take a lot of labour and time to process data and perform repetitive calculations. Predictive analytics and process optimisation are the two primary applications of algorithms. Businesses utilize it to forecast price changes, assess demand, comprehend consumer behaviour, and reduce market risks.[231] These apps lower expenses, simplify corporate processes, and match services to particular customer groups. Algorithms have changed a number of industries, including supply chain management, dynamic pricing, corporate security, and fraud detection.[232] By integrating deep learning into algorithms, the business can swiftly adjust its trading, pricing, and logistical plans. By comparing costs, forecasting trends, and offering information on product quality and preferences, algorithms also help customers.

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[229] Ariel Ezrachi & Maurice E. Stucke, Artificial Intelligence & Collusion: When Computers Inhibit Competition, University of Illinois Law Review (2017).
[230] Robert A. Wilson & Frank C. Keil, The MIT Encyclopaedia of the Cognitive Sciences (1999).
[231] Daniel Ajiga, Samuel Folorunsho et al., Predictive analytics for market trends using AI: A study in consumer behavior, International Journal of Engineering Research Updates (2024)
[232] Ariel Ezrachi & Maurice E. Stucke, Virtual Competition, J. Eur. Comp. L. & Prac. 585 (2016).

4.3.2 What is Collusion?

Collusion is an economic term referring to an outcome in the marketplace where competitors coordinate to earn higher profits than they would in a competitive environment.[233] Consumers pay a higher price as a result of this coordination, which can involve price or quantity manipulation or market segmentation along client groups or geographic area. Since the damage done to consumers is often greater than additional profits earned by businesses, collusion is not only detrimental to society in general and consumers, but also to businesses.[234] These two are the major forms of collusion. Explicit collusion is when companies settle prices or production levels in a formal agreement. Tacit collusion exists when companies become aware of interdependence and coordinate their actions in secret without the need to communicate openly. Most often, oligopolistic, open markets are the background for this sort of cooperation.[235] To ensure higher profits, collusion requires firms to coordinate their actions, monitor each other's compliance, and police the rules. When firms deviate from competitive conduct, it harms consumers and creates a deadweight loss.[236]

4.3.3 How does Algorithmic Facilitate Collusion?

Algorithmic collusion is when individual software agents communicate to influence market pricing or reduce competition, especially in high-speed trading. Both the financial system and customers can be detrimentally affected by this. Efforts to detect and halt collusion are hindered by the unpredictable intentions of AI systems and the complexity of the financial crisis.[237] The potential for algorithms to learn from market behaviours, decipher signals, and alter their actions is at the core of algorithmic collusion[238], as businesses will conspire on pricing and output decisions without a tacit

[233] Marc Ivaldi et al., The Economics of Tacit Collusion, Final Report for DG Competition, European Commission, at 58 (2003).
[234] Monopolies Commission, Algorithms and Collusion, Excerpt from Ch. 1 of XXII Biennial Report, Competition (2018).
[235] Maurice Stucke & Ariel Ezrachi, Antitrust, Algorithmic Pricing and Tacit Collusion, 5 CPI Antitrust Chron. (2015).
[236] Arthur Sullivan & Steven M. Sheffrin, Economics: Principles in Action, (Pearson Prentice Hall 2003).
[237] Jon Danielsson & Andreas Uthemann, On the Use of Artificial Intelligence in Financial Regulations and the Impact on Financial Stability, 36 J. Banking & Fin. L. 102 (2020).
[238] Abbot, *supra* note 184

agreement, it results in tacit collusion, which hinders competition and the welfare of consumers. The distinction between explicit and tacit collusion is muddled by sophisticated algorithms. By employing pricing tactics and monitoring competition, the companies utilising the technologies are able to adjust to market conditions organically. As self-learning algorithms adapt to shifting market conditions and come to anti-competition conclusions on their own without human intervention, they are extremely sophisticated.

4.3.4 Algorithmic Collusion in the Context of AI

Algorithmic collusion refers to a process by which computerized systems, in this case, usually algorithms, become coordinated market action without human intervention or express agreement.[239] In contrast to classical collusion based on a "meeting of minds" among rivals, algorithmic collusion can develop both passively or actively.[240] Passive Algorithmic Collusion exists when algorithms, programmed with their own goals (e.g., profit maximization, market share), individually develop parallel conduct that replicates collusion. For example, price algorithms may learn from the changes made by other algorithms and tend towards high, fixed prices, even without actual communication.[241] While Active Algorithmic Collusion occurs when algorithms either communicate or pass information to each other to collude. Although less common as a result of regulatory pressure, the possibility exists. The fundamental worry is that algorithms, especially those that use machine learning, can learn to predict and react to competitors' moves so quickly and accurately that they remove competitive pressure, with results similar to cartels.[242] This is especially relevant where AI systems are used in dynamic multi-player markets, such as digital content platforms or online shopping.

Academics traditionally distinguish algorithmic collusion into a few categories, emphasizing the different levels of sophistication and intentionality:[243]

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[239] Robert Wilson, *supra* note 38.
[240] Martino Banchio & Andrzej Skrzypacz, Artificial Intelligence and Auction Design (2022).
[241] Massimo Motta, Self-preferencing and foreclosure in digital markets: Theories of harm for abuse cases, Vol 90 International Journal of Industrial Organization (2023).
[242] Michael Kheyfets & David Kully, Antitrust Injury and Damages in Algorithmic Collusion Cases: Another “New Frontier”?, The Antitrust source (February 2025).
[243] Algorithms, Collusion and Competition Law: A Comparative Approach, Steven Van Uytsel, Salil K Mehra et al., (Elgar Publishing 2023).

- Signaling: Algorithms may "signal" price rises or tactics with quick changes, which are picked up by other algorithms and imitated, thereby inducing an upward spiral.

- Tacit Collusion through Learning: Reinforcement learning algorithms, experimenting with trial and error, may learn to keep prices high as the best approach when other algorithms follow the same strategy. This "learning to collude" occurs without any open communication.

- Hub-and-Spoke Collusion: A single algorithm (the "hub") may enable coordination among a number of other "spoke" algorithms, perhaps by offering real-time information or suggestions that lead them toward collusive behavior.

- Predictive Collusion: Future advanced AI might be so predictive of competitor pricing or content plans that companies do not have to compete so hard anymore, since the AI practically anticipates and neutralizes the competitive actions.

Though these categories are usually referred to in pricing contexts, their essential concepts of coordinated, anti-competitive results can also be applied to other areas, such as intellectual property.

Artificial intelligence (AI) adoption has gained pace across sectors, particularly in the area of pricing, with the advent of Large Language Models (LLMs) such as GPT-4 and Gemini. These LLMs are less susceptible to the challenges that previously ruled out independent collusion because they have been exposed to vast training data and can operate in multiple settings. Experts believe that one of the earliest domains in which LLMs will significantly make themselves felt is price-fixing. Even in the face of unclear guidelines, LLM-based pricing algorithms showed a natural tendency toward collusion. Regulatory scrutiny is underscored by the velocity with which these algorithms could increase prices to anti-competitive rates.[244]

[244] Sara Fish & Yannai A. Gonczarowski et al., "Algorithmic Collusion by Large Language Models,"

AI, especially machine learning and deep learning, significantly amplifies the risk of collusion due to several inherent capabilities. It is capable of Real-time processing of data since AI can process enormous volumes of market data (such as competitor activity, consumer behavior, and content usage patterns) at speeds that are humanly impossible, enabling instant adaptation and reaction.[245]It allows Dynamic Strategy Adjustment that Algorithms can learn and adjust their strategies constantly based on feedback in real-time, it is simpler to converge on collusive equilibria and respond quickly to deviations. It is also paired with predictive power which enables the AI to forecast future market movements and competitor behavior lessens uncertainty, an essential component that inhibits traditional collusion. Whenever algorithms are able to predict with some certainty how others will behave, it becomes less risky and more stable to coordinate behaviour.[246] The other main issue is complexity and opacity, that AI algorithms' complex and frequently opaque nature makes it difficult to recognize collusive behaviour. The "black box" issue makes it difficult for regulators to easily comprehend why things worked out in certain ways or detect human intention behind them.[247] These features of AI are a very valuable instrument for optimizing individual firm actions, yet together, they are a systemic risk of major proportions for coordinated effects beyond pricing to other types of market conduct, even those affecting intellectual property rights.

Algorithmic collusion, along with AI, poses severe threats to existing market and economic systems. AI and algorithms can also exploit copyrighted content without directly violating laws, threatening copyright protections. Through algorithmic collusion, AI can modify copyrighted works to create original-seeming content, allowing companies to profit without true creativity. While content-monitoring algorithms detect infringement, the same technology can obscure altered content, making it hard to trace. As a result, AI-generated works can bypass copyright checks and appear as entirely new creations. This will be dealt in detail in the following sub section.

Papers 2404.00806, arXiv.org, (2024).
[245] Michael Kheyfets, *supra* note 48.
[246] Brics Competition Law And Policy Centre, Digital Era Competition: BRICS View (2019).
[247] Ariel Ezrachi, *supra* note 29.

4.4 ALGORITHMIC COLLUSION AND INTELLECTUAL PROPERTY RIGHTS – INDIAN PERSPECTIVE

The convergence of intellectual property rights and algorithmic collusion is a new but salient field of inquiry. Whereas IP law has been used to address singular acts of infringement, the threat of organized, AI-based violations presents complex issues of causation, liability, and enforcement in the Indian legal system.

4.4.1 Algorithmic Collusion – A new pathway to IP violations.

Artificial intelligence systems can be used to create or enable the generation and dissemination of infringing work. It may be achieved in a number of ways such as:

1) Copyright Infringement through Coordinated Generation

Generative AI models can learn and imitate artistic styles, writing voices, and musical pieces from what they are trained on.[248] When several AI systems, created by various parties or even the same party but running independently, are each trained on equivalent data, they would be likely to converge on creating material significantly equivalent to that which already exists under copyright or in the unique style of a given artist/authors. For example, if multiple AI art generators are given training with the artworks of a specific artist (e.g., Van Gogh), they may "collude" by always creating images that violate the artist's style or particular artwork and overpopulating the market with mimetic content.[249] AI systems may be utilized by various users or entities to jointly generate huge amounts of content that are considered derivative works without permission. This can take the form of AI models from various firms generating remarkably similar storylines, musical melodies, or visual elements, and thereby causing wide-scale, concerted infringement.

The collusion in this case is not always a conscious agreement among human parties, but is an emergent behavior of several interacting AI systems working together to use

[248] Andres Guadamuz, Artificial intelligence and copyright, WIPO Magazine (1st October 2017).
[249] Kalpana Tyagi, Copyright, text & data mining and the innovation dimension of generative AI, Journal of Intellectual Property Law & Practice, Volume 19, Issue 7, July 2024, Pages 557–570,

or copy copyrighted content for profit.[250] Algorithms might also "collude" to evade current anti-piracy controls or content filters. For instance, if an AI system discovers how to create content that avoids detection, other algorithms would have the ability to follow suit soon enough, generating a concerted effort that would flood the sites with infringing content.

2) Market Manipulation and Destruction of IP Value:

When algorithms across AI systems conspire to create a flood of identical, usually lower-quality or free, content that copies copyrighted material, it can greatly undervalue the original intellectual property.[251] Take the case of several AI news aggregators or generative AI platforms generating articles duplicating the substance or even significant portions of high-end news material, without appropriate licenses, it disempowers the subscription-based models and ad revenue of original publishers of news.[252]This concerted deluge of free AI-generated content can damage the market for human-generated intellectual property. Another significant concern is the repression of licensing revenues.

If AI businesses as a group can collectively count on broad interpretations of fair dealing or the unlikelihood of proving infringement to result in a de facto free-for-all with respect to copyrighted training material, it stifles the growth of strong licensing markets.[23] This collective subversion of licensing fees, enabled by extensive, concerted (if tacit) use of copyrighted content for AI training, may be viewed as algorithmic collusion damaging IP value.[253]The concerted activity of dominant AI systems, in a position to drive user preference or search rankings, may direct demand away from authentic creators to AI-produced or AI-mashed content, skewing the whole creator economy and affecting human creators' potential to generate revenue from their IP.[254]

[250] Pamela Samuelson, Generative AI meets copyright, Vol 381 Science, (2023).
[251] Daniel J. Gervais, *supra* note 26.
[252] NYT Company v. OpenAI, Inc. and Microsoft Corp., No. 1:23-cv-11195 (S.D.N.Y. filed Dec. 27, 2023)
[253] Matthew Sag, Copyright Safety for Generative AI, Vol 61 Houston Law Review (2023).
[254] Eleonora Rosati, Copyright in the Digital Single Market (Oxford University Press 2019)

The above description does point out to the fact that algorithmic collusion does lead to IP concerns. We can also rely on certain examples that point towards this. tasks once performed by only humans are being carried out or augmented by machines, which often perform better than humans ever could. In the copyright space alone, there are devices that can now recognize songs and other expressive content by listening to them[255], virtual assistants and bots that can locate and play user-requested content[256], and soft-ware that can use machine learning techniques to create artwork based on a model derived from 15,000 portraits painted over the

past six centuries[257]. A piece of art created using this software recently sold at auction for over $400,000.[258] In the area of copyright, protection of digitized works is steadily increasing which is mediated by algorithmic enforcement systems that are intended to effectuate the rights of copyright owners while simultaneously limiting the liability of content intermediaries. On YouTube, Google, and many other online platforms, both internet service providers (ISPs) and copyright owners have deployed detection and removal algorithms that are intended to purge illicit content from their sites.[259] Sag argues that online algorithmic policing has already changed the nature of copyright enforcement and so effectively changed the nature of copyright infringement. This very change in the nature of copyright and fair use brings in the question whether automated copyright should incorporate the aspect of fair use or any other statutory exceptions and the decision by the Ninth Circuit Court of Appeals in the matter of *Lenz v. Universal Music Corp*.[260] also discussed aspects with regard to the question raised above.

4.4.2 Associated Challenges and Inadequacy of the Indian Legal Regime.

The current Indian intellectual property law is confronted with significant challenges in dealing with algorithmic collusion because of the innate divergence between

[255] Mala Chatterjee & Jeanne C. Fromer, Minds, Machines, And the Law, Vol 119 Columbia Law Review (2019).
[256] Trent Gillies, Shazam Names That Tune, Drawing in Money and Users, CNBC (June 14, 2015),
[257] Jonathan Bastable, Is artificial intelligence set to become art's next medium?, CHRISTIE'S (Aug. 20, 2018).
[258] Portrait by AI program sells for $432,000, BBC (25th October 2018).
[259] Matthew Sag, Internet Safe Harbors and the Transformation of Copyright Law, 93 Notre Dame L Rev 499, 543–44 (2017); Maayan Perel and Niva Elkin-Koren, Accountability in Algorithmic Copyright Enforcement, 19 Stan Tech L Rev 473, 478–81 (2016).
[260] 815 F3d 1145 (9th Cir 2016).

conventional human-oriented legal principles and the independent conduct of AI. Traditional copyright infringement typically entails establishing that the infringer possessed knowledge or intent to replicate a copyrighted work.[261] Traditional collusion also demands a "meeting of the minds" or an express/tacit agreement between parties.[262] In algorithmic collusion, the collusive result arises from independent algorithm optimization without any human agents overtly agreeing to infringe or coordinate harmful IP behaviour.[263] This renders it extremely challenging to apply such prevalent doctrines as being dependent upon human intent or conspiracy. The Indian Copyright Act, 1957, approximately relies on human agency in acts of infringement.[264]This particular provision is silent on AI driven infringement and is a major drawback in the current scenario.

Establishing that an AI system, or its user, "intended" to conspire in infringing copyrighted material is a nuanced philosophical and evidentiary problem. The impenetrable nature of advanced AI models, also known as the black box, renders it nearly impossible to determine how they reach specific outputs or whether they are "colluding" with other algorithms.[265] It is challenging to draw a direct causal connection between the performance of several algorithms and a particular act of IP violation. For example, establishing that Algorithm A had an effect on Algorithm B to produce a similar infringing work is a huge burden of proof and since the burden in copyright infringement cases usually rests upon the plaintiff to establish substantial similarity and access.[266] The key question here is who is responsible when algorithmic collusion results in IP infringements. Is it, the AI developer/creator? They create and train the algorithms; the AI user/operator? They implement and employ the algorithms; the data provider? In case infringing data was utilized; the AI itself (as a legal person)? This would necessitate a major overhaul of legal personhood ideas, which is not even being considered in India.[267]

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[261] P Narayanan, Law of Copyright and Industrial Designs (4th ed. 2017).
[262] Competition Act, 2002, No. 12 of 2003, § 3 (India).
[263] *Supra* 30
[264] Indian Copyright Act, 1957, § 51.
[265] *Supr*a, 29
[266] R. G. Anand v. Delux Films, AIR 1978 SC 1613 (India).
[267] Ryan Abbott, The Reasonable Robot: Artificial Intelligence and the Law, Cambridge University Press (2020).

The Indian Copyright Act, 1957, targets direct infringers or those who authorize infringement. It also enacts provisions of secondary liability (e.g., for abetment or vicarious liability), but these normally involve an element of control or knowledge that is difficult to prove in autonomous algorithmic interactions.[268] The lack of firm rules of attribution for AI-powered collaborative infringement leaves a huge lacuna in the existing legal framework. The Indian Copyright Act also sets out remedies.[269] Although remedies such as injunctions, damages, and accounts of profit can be had, establishing the degree of harm or quantifying profits from an AI system's collusive IP infringement would be very difficult in view of the attribution and evidence problems.

Now, we will also look into the Competition Act as it forbids anti-competitive agreements and abuse of dominant position.[270] It is the leading legal instrument for dealing with collusion. Nevertheless, establishing the existence of an "agreement" under Section 3 typically needs to show meeting of minds or concerted practices, that algorithmic collusion can bypass. The CCI has started confronting algorithmic effects, and especially the price. In the case of *Samir Agrawal v. ANI Technologies Pvt. Ltd*., the CCI examined the charge of cartelization in ride-sharing service where algorithms determine dynamic pricing.[271] Although the CCI eventually did not find violation of Section 3(3), based on absence of evidence of explicit agreement, it recognized the likelihood of algorithms enabling tacit coordination. The spotlight of the Competition Act is on competition in the market, rather than on intellectual property infringement arising from collusive conduct. Although collusive IP infringement might have anti-competitive implications, exclusively pursuing it through the competition law may not best safeguard the particular rights of authors and owners of copyrights, or given the full set of IP remedies. There is an overlap of jurisdiction but also a gap in respect of direct actions of IP infringement enabled by algorithms, thereby calling in for reforms in the area.

When one looks at the regime of international competition law, we have cases such as online poster sales, *U.S. v. David Topkins* where human price-fixers employed an

[268] Narayanan, *supra* note 68.
[269] The Indian Copyright Act, 1957, §§ 55-62.
[270] Competition Act, 2002, §§ 3, 4.
[271] Case No. 37 of 2017, Competition Comm'n of India (CCI) (Nov. 6, 2018).

algorithm to coordinate, though the algorithm itself was not the colluder have emphasized the implementation of algorithms in classic collusion.[272] The European Commission has also strongly indicated, pointing out that enterprises are still liable for collusive effects even when algorithms make them possible.[273]

The most important insight from developments in international competition law is that AI has the ability to make collusive results more likely and that existing legal frameworks are not equipped to keep up. This applies to IP as well, since the same underlying technology makes coordinated IP infringement possible. Deepfakes and AI-created content that faithfully replicates real people, voices, or artistic styles create concerns regarding coordinated mass infringement.[274] As an example, if several AI systems, owned by separate parties, are employed in creating and disseminating deepfakes of a celebrity's right of publicity or an artist's copyrighted work, this might be considered a distributed, but not coordinated, kind of "collusion" in infringement.[275] Another argument concerning AI models creating music or artwork in the "style of" great artists is tangent to this.[276]

These conversations point to a fundamental need for legal regimes that can detect, assign, and punish AI-facilitated patterns of conduct that cumulatively erode intellectual property rights, independently of overt human intent or classical conspiracy. The attention is turning from discrete acts of infringement to structural threats arising from the self-directed and interactive potential of AI.

4.5 CONCLUSION

The chapter has traversed through the complex and evolving legal landscape where artificial intelligence, international trade, and intellectual property rights converge, and

[272] 3:15-cr-00201, (N.D. Cal.)
[273] Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on Contestable and Fair Markets in the Digital Sector (Digital Markets Act), 2022 O.J. (L 265) 1; Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services (Digital Services Act), 2022 O.J. (L 277) 1.
[274] Mark A. Lemley, How Generative AI Turns Copyright Upside Down, Vol 25 Science and Technology Law Review (2024).
[275] Arjith Singh v. Codible Ventures and Ors, SCC OnLine Bom 2445.
[276] Rachel Reed, AI created a song mimicking the work of Drake and The Weekend. What does that mean for copyright law?, (Harvard Law Today, 2nd May 2023).

specifically sought to addresses the difficulties faced by the Indian copyright regime. The chapter begins by addressing AI's dependence on massive datasets for its formation and pointing to the built-in conflict between encouraging technological innovation and ensuring the proper rights of authors and copyright owners. The purpose of this chapter was to analyse two substantive areas: the extension of fair dealing to AI training data and the emerging risk of algorithmic collusion to intellectual property infringement.

The analysis of fair dealing in Indian copyright law envisaged under Section 52 of the Copyright Act, 1957 showed a structure which, while seeking to reconcile private rights with public interest, is unable to meet the unprecedented scale and character of AI's data consumption. Although judicial decisions such as *Civic Chandran v. Ammini Amma*[277] have provided elastic interpretations, the customary conditions of fair dealing are challenging to apply to AI training processes, especially in light of their commercial purpose and "black box" issue. The controversy on "transformative use," although latently present in Indian case law, gets severely tested when AI outputs may replace original human works, directly affecting the markets. The ongoing *ANI Media Private Limited v. OpenAI*[278] case before the Delhi High Court is a testing point for the Indian judiciary in demarcating the limits of fair dealing for commercial AI training data. A comparative analysis highlighted that, while the US 'fair use' standard provides flexibility, it also results in extensive litigation, whereas the EU's express Text and Data Mining (TDM) exceptions, with their precise opt-out provisions, provide more certainty under the law, although with their own specificity of concerns. This indicates that India's existing dependence upon general exceptions may continue to result in uncertainty, calling for more tailored legislative intervention.

In addition, this chapter also illuminated the new and pernicious risk of algorithmic collusion in intellectual property infringement. Algorithmic collusion refers to the fact that autonomous AI systems, through their learning and interaction, can create correlated effects undermining IP rights without explicit human intention to infringe. We have discussed how it can play out as large-scale copyright infringement through coordinated content creation market manipulation causing devaluation of original

[277] 1996 PTC (16) 670 (Ker)
[278] CS(COMM) 1028/2024

content, and suppression of licensing revenues. It is a challenge to prove such collusion under prevailing Indian IP and competition laws, mainly because of the "black box" nature of AI, the absence of traditional notions of intent, and difficulty in attributing liability in decentralized algorithmic interactions. The prevailing Indian legal regime, conceived for human-involvement-based infringement, sufficiently lacks the specific provisions and evidentiary mechanisms necessary to tackle these new forms of AI-driven IP infringements effectively, echoing a substantive lacuna.

Overall, the emergence of sophisticated AI has exposed India to a twin challenge: aligning its current fair dealing provisions to meet the data needs of AI innovation without undermining creators' rights, and being anticipatory in addressing the systemic threats to the integrity and value of intellectual property caused by algorithmic collusion. The present legal framework, constructed on the conventional understanding of authorship, originality, and infringement, is stretched to its limits by the autonomous, joint, and frequently inscrutable activities of AI systems. The conclusions of this chapter highlight a clear imperative for an innovative and forward-thinking legal system in India. Merely reinterpretation of current statutes may be inadequate in the face of the speed and character of technology development. Rather, a more expansive strategy is necessary.

The observations arrived at from this analysis of fair dealing and algorithmic collusion will be an important stepping stone for Chapter 5, which will contain detailed recommendations and proposals for the Indian judicial system. Chapter 5 will recommend tangible policy and legislative changes intended to promote AI innovation in a responsible manner, enhance intellectual property safeguards, and enable a fair and balanced digital economy for all concerned in India's increasingly globalized trade universe.

CHAPTER 5

CONCLUSIONS & RECOMMENDATIONS

5.1 INTRODUCTION

The unprecedented rate of Artificial Intelligence (AI) development has brought about a new era of technological advancement, which has profoundly influenced various aspects of human society. As elaborated in the above chapters, this transformative feature, i.e., generative AI, has penetrated deeply into the traditional fields of international trade and intellectual property rights (IPR). While AI has the potential to deliver unprecedented efficiency and innovation, the advancement of AI at such a speed has also uncovered enormous challenges and loopholes of existing legal standards. The current chapter concludes the most significant findings of the dissertation, which answer the research questions posed in Chapter 1. In addition, it sets out a set of potential and practical suggestions for developing a balanced legal framework to facilitate AI innovation while firmly safeguarding intellectual property rights and encouraging fair international business.

5.2 ADDRESSING RESEARCH QUESTIONS

This dissertation aimed to examine the complex legal relationship between AI, international trade, and intellectual property rights, specifically in relation to copyright law with special emphasis on the Indian legal regime. The research questions framed this investigation, and on examination the following aspects were observed.

The trajectory of Artificial Intelligence from its philosophical foundations to the complex deep learning platforms and the resultant arrival of generative AI has caused a paradigm shift, thoroughly transforming both the copyright sector and the global trade landscape. In the copyright sector, the effect is far-reaching and multifaceted. Traditionally, copyright law has been premised upon the presuppositions of human authorship, originality, and creativity, but with the development of AI, specifically generative AI, this anthropocentric model is disrupted. As Chapter 3 points out, AI

models are capable of producing works—from art and literature to music—that are "indistinguishable from human-authored ones." This is a direct challenge to the foundation requirement of human authorship, as in the U.S. Copyright Office's position and court rulings such as Thaler v. Perlmutter, which reconfirmed that "human authorship is a bedrock requirement of copyright." This leaves a legal vacuum for works created by AI without human intervention, raising questions regarding their protection and ownership. The difference between "fixed expression" and "algorithms/machine learning" gets muddled. Although source code is copyrightable, the "trained weights and parameters that make up a model's functionality can be considered unprotectable functional elements," as explained in Chapter 3. This subverts the classic idea/expression dichotomy, since the worth of most AI systems is not in readable code but in learned patterns.

The most immediate effect on copyright is due to AI's inexhaustible appetite for enormous datasets for training. Chapter 4 considers how the "ingestion" or "scraping" of copyrighted materials for training raises fundamental questions about infringement and the scope of fair dealing exceptions. The sheer vast magnitude of use fundamentally differs from customary fair dealing circumstances, where AI ingests millions of works copyright, usually whole. This scale tests the traditional notion of fairness in Section 52 of the Indian Copyright Act, where there are no clear quantitative standards. The "black box" function of AI models makes things even more complicated, as it is difficult for copyright owners to demonstrate exactly what components were used or ingested and therefore establish infringement. Apart from direct infringement, the dissertation points out the new threat of "algorithmic collusion," wherein AI systems, by autonomous learning, can lead to coordinated market events in the absence of any conscious human intention to collude, resulting in widespread IP infringement, market manipulation, and the stifling of licensing revenues. In international trade, AI has become a game-changer, performing both as a traded good and service.

Chapter 2 describes how AI systems, including hardware and intangible services (such as APIs), disrupt traditional trade classification systems and regulatory principles applied to differentiate sharply between physical products and intangible services. This twinning nature introduces classification ambiguity and possible regulatory arbitrage. Importantly, the development of AI is significantly dependent on cross-border data

flows that are referred to as important sources of input for AI systems and channels for delivery of AI services. The fact that these data flows increase exponentially translates to countries with larger pools of data can create comparative advantages in AI development, and this can fundamentally alter international specialization and trading patterns. This provokes difficult questions of data sovereignty, privacy protection, and equitable access to technological benefits by nations at different levels of development. The advent of AI also has deep trade policy implications.

Varied national responses to data governance—ranging from the US's light-touch approach to regulation to the EU's regulatory regime and China's emphasis on cyber sovereignty—place enormous barriers in the way of global harmonization and have the potential to result in non-tariff barriers to trade. Uncertainty over international norms for the classification of AI-generated products also threatens inconsistency with WTO principles of non-discrimination and the potential for dispute under such agreements as GATS or TRIPS. The problem presented by the 'fair use' argument, and the 'algorithmic collusion' conundrum, essentially stretches to the breaking point classical copyright conventions by compelling a reconsideration of their own underlying assumptions, especially in India, on the dimensions of scope, purpose, and responsibility.

AI's use of data, however, is one which falls on a scale and through means completely alien to human cognition. This measure contradicts the "amount and substantiality of the part used" factor of fair dealing analysis directly. Human use may constitute fragments, but AI tends to use whole copyrighted works, it being challenging to make an argument about insubstantial portions.[279] The "commercial purpose" of AI training, another central factor in fair dealing consideration, also contradicts the conventional concept of exceptions, which tend towards non-commercial or individual use. As one observes from the *India TV Independent News Service Pvt. Ltd. v. Yashraj Films Pvt. Ltd*[280]. case, commercial exploitation tends to militate against fair dealing, although not determinatively. The transformative use doctrine, which permits uses creating new meaning or purpose, is severely strained by generative AI. Although advocates of AI say that model training is intrinsically transformative since they learn patterns and not

[279] *Supra* note Chapter 4.
[280] AIR 2013 (NOC) 315 (DEL.)

direct copies, opponents counter that if what the AI produces copies features of copyrighted training content, or if it is able to produce new content in the distinctive style of a writer whose books were used in training, then the training process enables infringement. This directly impacts the "effect upon the potential market for or value of the copyrighted work," a crucial fair dealing factor. The black box quality of AI models, in which it is often hard, if not impossible, to ascertain precisely what copyright material from the training dataset has gone into a specific output, produces an opacity that place a heavy evidentiary burden on the copyright holder. That opacity frustrates the capacity to carry out a robust fair dealing analysis since concepts such as amount and substantiality of portion used become determinable.

Additionally, the lack of clear "text and data mining exceptions" in Indian legislation, as opposed to the EU, creates a broad legislative void over computational analysis of copyrighted content for AI purposes. Algorithmic collusion poses an even more basic threat to standard copyright principles by upsetting the very precepts of intent, agency, and direct causation in infringement.[281] The conventional copyright infringement usually involves proving that the infringer had knowledge or intent to copy a copyrighted work, but in algorithmic collusion, the "collusive outcome results from independent optimization of algorithms without any human actors consciously agreeing to infringe or collaborate on detrimental IP behavior." This renders it very difficult to impose such widespread doctrines as being based on human intent or conspiracy.

The opacity of sophisticated AI models, the "black box" renders it "virtually impossible to know how they arrive at certain outputs or if they are 'conspiring' with other algorithms. This complexity renders it challenging to "establish a direct causal link between the performance of a group of algorithms and a single act of IP infringement. This in turn affects the burden of proof in copyright infringement actions, which traditionally lies with the plaintiff to prove substantial similarity and access. The Indian Copyright Act, 1957, roughly depends on human agency in acts of infringement and therefore is poorly equipped to deal with AI-generated violations.

[281] *Supra* note Chapter 4.

On the basis of the extensive analysis in Chapters 1 to 4, the present copyright regime in India is clearly insufficient for dealing with the complex challenges of generative AI. The present system, primarily designed for a pre-digital age and human-authorship context, has trouble keeping pace with the velocity, magnitude, and autonomous character of AI creation.

Firstly, the anthropocentric structure of the Indian Copyright Act, 1957, is a major handicap. As Chapter 3 emphasizes, the Act grants copyright for 'original literary, dramatic, musical and artistic works' by virtue of Section 13, with human authorship being an unstated but essential condition. In contrast to the UK's explicit provisions over computer-generated works (Section 9(3) of the Copyright, Designs and Patents Act 1988), the Indian legal regime does not clearly give directions with regard to non-human authorship. This puts AI-generated works in a legal vacuum," sparking "substantial doubt with regard to the protectability of works in which AI systems assist human authors or generate content without human intervention. This regulation by inertia can vitiate innovation and disadvantage Indian developers internationally.

Secondly, India's narrowly drafted fair dealing provisions are not well tailored for AI's data usage. Section 52 of the Copyright Act, 1957, delivers an "all-inclusive list of acts which fall short of infringement," but it significantly does not contain express exceptions for computational analysis, text and data mining, or machine learning purposes. The current *ANI Media Private Limited v. OpenAI*[282] case, talked about in Chapter 4, is a test case for Indian judiciary, focusing on the "considerable legal uncertainty" in applying generic "research" exceptions to "big commercial AI undertakings" and the notion of "transformative use."

Thirdly, the Indian legal system is woefully under-prepared for algorithmic collusion. Conventional Indian IP infringement and competition laws depend largely on proving human "knowledge or intent" or "meeting of the minds" for collusion. Nonetheless, algorithmic collusion emerges from autonomous algorithm optimization without any human actors explicitly agreeing to violate or collude on adverse IP conduct. This renders it extremely difficult to apply such widespread doctrines. The impenetrable

[282] CS(COMM) 1028/2024

complexity of sophisticated AI models renders it almost impossible to know how they arrive at particular outputs or whether they are 'colluding' with other algorithms, creating enormous challenges for imposing liability and establishing causation under the Indian Copyright Act, 1957, which seeks out direct infringers or those sanctioning infringement. Although the Competition Act, 2002, has started to recognize algorithmic impacts, it is concerned with market competition, rather than direct IP infringement, leaving a substantive lacuna in dealing with AI-driven IP infringement. India's lackadaisical participation in international harmonization processes, as seen in Chapter 3, adds to the insufficiency. While global discourse such as at WIPO is taken up on AI and IP, India's limited leverage curbs its capacity to influence global standards that would be favorable to its domestic industries. This exposes India to the heterogeneity and sometimes conflicting legal responses of other jurisdictions, and this causes "protection gaps" and "barriers to international trade" in AI content and services.[283]

In short, the Indian copyright regime, under its traditional anthropocentric model, inflexible fair dealing rules, absence of explicit TDM exceptions, and unreadiness for algorithmic collusion, is critically lacking. It generates large legal uncertainty to India's growing AI industry," that could "vitiate innovation and put Indian developers at a disadvantage worldwide. A more liberal and progressive approach is acutely needed. Correcting the legal shortcomings of the Indian copyright system calls for a multi-faceted, holistic strategy with legislative changes, out-of-the-box policy proposals, and active participation with international initiatives. The overarching need is to achieve a fine balance that promotes AI innovation while strongly safeguarding intellectual property rights and assuring a reasonable digital economy.

5.3 RECOMMENDATIONS FOR LEGAL REFORMS & POLICY REFORMS

To fill the current gaps in the laws and establish a more balanced and efficient legal system for AI, international trade, and intellectual property rights in India, the following suggestions are proposed:

[283] supra note Chapter 3.

- Enact Specific Text and Data Mining (TDM) Exceptions & Amend Section 52 for TDM:

  Add a new, express sub-section in Section 52 of the Copyright Act, 1957, expressly dealing with TDM exceptions. This provision should extend to non-commercial purposes (e.g., research, academic use, public interest) and commercial purposes (e.g., training commercial AI models). This would bring much-needed legal clarity to AI developers and researchers in India. Institute an Opt-Out Scheme for Commercial TDM. This serves to balance the desire for AI training data with creators' control over their work and potential licensing value.

- Define "Author" to Comprehensively Encompass Legal Persons or Entities for Works Generated by AI:

  Revise Section 2(d) of the Indian Copyright Act, 1957, to specifically cover works generated by AI. This change should make clear that in cases where AI has a major part to play in the creation of content, the "author" may be the individual or entity responsible for creating the "arrangements necessary for the creation of the work." This might be the developer, the owner, or the operator of the AI tool, varying with the degree of creative contribution and control. This strategy, like the UK's Section 9(3) of the Copyright, Designs and Patents Act 1988, recognizes the immense human labor required for programming, training, and installing AI systems so that AI-generated works are not automatically placed in the public domain and thus encourage investment in AI creativity. Adopting a Tiered Model of Authorship and Ownership, by means of the human contribution to AI generation could be incorporated. The works could be classified as:

    - AI-Assisted Works (High Human Input): Unambiguously provide that copyright must rest exclusively in the human author when AI is only being used as a sophisticated tool. This maintains the classical definition of authorship wherein human creativity takes center stage.

- ♦ AI-Co-Created Works (Substantial Human-AI Interaction): For creations where AI creates substantive material but humans add substantial creative inputs, parameters, or curate results, make it clear that copyright may vest with the human user/operator. This would necessitate a "modicum of creativity" test to be applied to the human's specific input and creative decision-making, separating it from mere mechanical functioning.

- ♦ Autonomous AI Works (Minimum Human Involvement): For works that are actually produced by AI systems involving minimum or no direct human input other than their original programming and training, consider two major options: Public Domain Approach and Sui Generis Right of Limited Scope.

- Foster Strong and Effective Licensing Arrangements:

  Encourage and enable the creation of strong, transparent, and effective licensing arrangements for copyrighted content utilized in AI training. This could include:

  - ♦ Collective Licensing Organizations: Encourage the creation or growth of collective licensing organizations that can administer rights for large numbers of content, facilitating the licensing of data by AI developers lawfully.
  - ♦ Standardized Licensing Agreements: Encourage the creation of standardized, machine-readable licensing agreements that make it convenient to procure permissions for AI training data, providing reasonable compensation to rights holders.

  - ♦ Micro-Licensing Models: Investigate emerging micro-licensing models that enable granular permissions and payments for data use, given the varied nature of AI training requirements.

- Adopt Ex-ante Regulatory Steps for High-Risk AI:

Adopt proactive, ex-ante regulatory steps for high-risk AI systems (e.g., systems for dynamic pricing in concentrated markets, or mass IP-infringing generative AI models). These steps may involve:

- Mandatory Algorithmic Audits: Mandate periodic, independent audits of AI algorithms to evaluate their risk of collusive activity or IP infringement.

- Impact Assessments: Require AI developers to make "algorithmic impact assessments" prior to deploying high-risk systems, assessing their probable impacts on competition and intellectual property.

- Transparency Requirements: Enforce stringent transparency requirements for developers of the design, training data, and decision-making rules of high-risk AI algorithms, where possible without disclosing trade secrets that actually safeguard innovation.

- Limited Reversal of Evidentiary Burden:

  For certain, well-delineated cases of high-risk AI applications where there is suspicion of algorithmic collusion or widespread IP infringement, adopt a limited reversal of the evidentiary burden. This would mean that the AI developer/operator must prove that their algorithms are designed with safety features against collusive results or IP infringement, alleviating some of the burden from the plaintiff.

- Create a Balanced National AI Strategy with a Firm IP Emphasis:

  India's current "National Strategy for Artificial Intelligence" needs to be revised with a proper, detailed, and future-oriented intellectual property framework. It should cover authorship, originality, fair use/TDM, liability, and enforcement in relation to AI in a consistent manner, giving a common vision and direction

to all the stakeholders. It must also take into account the ethics of developing and applying AI.

- Create a Permanent High-Level Inter-Ministerial Task Force:

  Form a permanent, high-level inter-ministerial task force with members drawn from the Ministry of Commerce, Ministry of Law and Justice, Ministry of Electronics and Information Technology, Department for Promotion of Industry and Internal Trade (DPIIT), and involved intellectual property offices. This task force would be tasked with ongoing review, analysis, and refresh of AI-related IP and trade policies to ensure a holistic and responsive approach that addresses the speed of technological change and changing economic impacts.

- Invest in Public Education and Awareness Campaigns:

  Initiate far-reaching public education and awareness campaigns involving AI developers, content developers, legal experts, policymakers, and the general public. Describe the intricacies of AI's interface with IP rights in a simple language.

- Actively Pursue Bilateral and Multilateral Agreements:

  India must aggressively pursue and promote bilateral and multilateral agreements with major trading partners and international organizations. Such agreements must address in specific terms cross-border enforcement difficulties associated with AI-based IP violations and algorithmic conspiracies. This can involve the incorporation of provisions for mutual legal assistance, exchange of information for investigations, and harmonized standards of liability.

- Make Use of International Platforms:

  India needs to play a more assertive and leading role on international platforms like WIPO, WTO, UNCTAD, and the G20. These are highly important platforms for setting global norms and best practices on AI, IP, and competition.

If India plays an active role, it can make sure that its specific socio-economic environment and interests are heard while setting global standards.

- Incentivize and Invest in Technical Solutions:

  Incentivize and invest in research and development of technical solutions that can assist in detecting and preventing algorithmic collusion and IP violation:

  - ♦ AI-Powered Detection Tools: Fund the creation of AI-driven tools for regulators and rights holders to identify collusive behavior in algorithmic activity, both pricing and content creation. This may include anomaly detection systems and pattern recognition algorithms.

  - ♦ Improved Transparency and Explainable AI (XAI): Support research in XAI methods to increase the interpretability of AI models and the transparency of their decision-making. This would enable a greater understanding of how AI systems produce outputs and whether they are carrying out unintended collusive IP infringement.

- Promote Responsible AI Development and Ethical Guidelines:

  Encourage and incentivize the development and deployment of AI systems that are designed to be ethical, fair, and respectful of intellectual property rights by default. This can be achieved through a combination of regulatory incentives, industry self-regulation, and by encouraging ethical AI frameworks.

- Ensure Ongoing Review and Flexibility of Frameworks:

  With the unprecedented and accelerated rate of AI advancement, the legal and policy frameworks need to be constructed with ongoing review and flexibility in mind. This involves establishing:

- ♦ Ongoing Legislative Upgrades: Requiring regular reviews (e.g., every 3-5 years) of IP and trade legislation concerning AI to keep them current and effective.

- ♦ Regulatory Sandboxes: Establishing "regulatory sandboxes" where new AI technologies can be piloted under controlled conditions so regulators can see their implications and craft suitable legal response before deployment.

- Define "Agreement" for Algorithmic Collusion:

  The Competition Act must be revised to take direct aim at cases where algorithms, by virtue of their self-directed learning and interaction, produce collusive effects without express human accord. This might include establishing "algorithmic concerted practices" or "emergent collusion" as a specific type of anti-competitive practice. The amendment must specify guidelines for recognizing and establishing such collusion, going beyond the classical meeting of the mind's threshold.

5.4 CONCLUSION

The passage through the history of Artificial Intelligence, from its philosophical foundations to the present period of generative AI, opens an exponent of a technological revolution that has immense bearing on the international legal regime. This dissertation has carefully traced the complex interrelationship between AI, international trade, and intellectual Property Rights and has shown that the difficulties created by AI challenge the very pillars of current legal regimes.

The analysis has established that whereas AI offers unprecedented potential for economic development and social progress, its sudden incorporation into creative work and international commerce has generated intense friction with long-standing intellectual property paradigms, most notably Copyright law. The anthropocentric character of copyright, established for human creation, finds it difficult to adapt to the independent generative potential of AI. Terms such as "originality," "authorship," and

the use of "fair use" or "fair dealing" are put to the extreme when faced with the capability of AI to ingest huge volumes of copyrighted content and generate outputs which are virtually indistinguishable from human works. The different divergent trajectories followed by different jurisdictions around the world—from the prohibitive approach in the US to more flexible frameworks in the EU and China—highlight the absence of global harmonization. This fragmentation creates a real impediment to cross-border exchange in AI technologies and AI-authored content, contributing to market distortions and complexity.

Additionally, the dissertation has illuminated the new and evolving threat of "algorithmic collusion" in the IP realm. This is a phenomenon under which AI systems, through their interactions and learning, could collectively subvert intellectual property rights without human cognizance of such intent, posing novel challenges to liability attribution and enforcement under current legal frameworks. In particular, the Indian copyright system, anchored in pre-digital age assumptions and without clear provisions for AI-created works or explicit text and data mining exceptions, is generally ill-equipped to handle these new challenges of today. This legislative lag generates considerable legal uncertainty, which could slow down India's growing AI industry and put its creative industries at risk from new patterns of infringement.

In summary, the AI age calls for a serious rethinking and re-calibration of legal systems. Merely reinterpretation of existing laws won't do. An active and holistic strategy, including legislative changes, focused policy measures, and firm international cooperation, is the need of the hour. The proposals set out in this chapter seek to offer a blueprint for India to create a balanced, innovation-friendly, and rights-based legal system. In so doing, India can not only protect its intellectual property and creative economy but also establish itself as a responsible global leader in AI, working towards an equitable and just digital future. The effective steering of this intricate web of laws will itself decide the manner in which human civilization uses the revolutionary potential of AI for the common good, while preserving the essential values of creativity and justice.

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APPENDIX