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AI IN THE REALM OF IPR

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ABSTRACT

The utilization of Artificial Intelligence (AI) across multiple layers of human existence has sparked some serious conversations concerning Intellectual Property Rights (IPR). In turn, this paper provides an extensive review of AI and its journey to the present day, from origins of thinking and concepts, to societal implications and the functional role of AI. Additionally, how AI transformed over time—from rudimentary rule-based systems to multifaceted learning algorithms—has changed the landscape of how machines emulate human thinking which in turn has prompted legal and ethical questions.

The central focus of this paper is the multifaceted intersection of content produced by AI, such as text and illustrations, to the sphere of intellectual property law. AI systems, AI now can create innovative and creative works either at a large-scale or with little human interface, are reshaping the fundamental notions of who is an author to works, which notion of originality to claims of ownership to works. The ways intellectual property law approaches these challenges is explored herein, and more specifically, copyright issues and patent law issues. The importance of examining potential legal personhood, liability, and attribution of rights to works produced by AI systems is critically analyzed.

Moreover, the contribution, and growing reliance to a degree featuring applying AI to IP rights administration is discussed. Automated trademark search engines, patent application handling, and content identification and removal have achieved significant progress, and bring greater efficiency and need to examine transparency and fairness and responsibility.

Through exploring a variety of global perspectives, legal developments, and technological advances this article highlights the need for proactive and timely revisions to the law to insure the protection of innovation, while sustaining the integrity of intellectual property systems in an AI world.

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WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial intelligence (AI) is a term used in computer science to describe a machine, robot or a computer that exhibits human-like intellect. It is a term that refers to a computer ora machine's ability to replicate or mimic the attributes of the human mind, such as learning from examples and experience, identifying things, interpreting and responding to language, making decisions, finding solutions to various problems and combining all these with other capabilities to carry out functions a human might perform like driving a car or greeting a hotelguest.

After decades of being confined to science fiction, today, AI has become a part of our daily lives. The rapid availability of enormous amounts of data and the simultaneous development and widespread availability of computer systems capable of processing all that data faster and more accurately than humans can has worked as a catalyst in the development of AI. Today AI is completing our words and sentences as we type them, helping us navigate the directions while we drive, vacuuming our floors, and recommending what we should buy or binge-watch next. It is also running applications like medical image analysis that help qualified professionals to complete work faster and with greater efficiency.[8]

The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal. A subset of artificial intelligenceis machine learning, which refers to the concept that computer programs can automatically learn from and adapt to new data without being assisted by humans. Deep learning techniquesenable this automatic learning through the absorption of huge amounts of unstructured data such as text, images, or video.

When most people hear the term artificial intelligence, the first thing they usually thinkof is robots. That's because big-budget films and novels weave stories about human-like machines that wreak havoc on Earth. But nothing could be further from the truth.

[8] Artificial Intelligence, June 2020; *available at: https://www.ibm.com/in-en/cloud/learn/what-is-artificial-intelligence* (last visited on June 20, 2021)

Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the simplest to those that are even more complex. The goals of artificial intelligence include mimicking human cognitive activity. Researchers and developers in the field are making surprisingly rapid stridesin mimicking activities such as learning, reasoning, and perception, to the extent that these canbe concretely defined. Some believe that innovators may soon be able to develop systems thatexceed the capacity of humans to learn or reason out any subject. But others remain skeptical because all cognitive activity is laced with value judgments that are subject to human experience.

As technology advances, previous benchmarks that defined artificial intelligence become outdated. For example, machines that calculate basic functions or recognize text through optical character recognition are no longer considered to embody artificial intelligence,since this function is now taken for granted as an inherent computer function.

AI is continuously evolving to benefit many different industries. Machines are wired using a cross-disciplinary approach based on mathematics, computer science, linguistics, psychology, and more.[9]

CATEGORIZATION OF ARTIFICIAL INTELLIGENCE

Artificial intelligence can be categorized into two types: weak and strong. Weak artificial intelligence, which is also known as Narrow AI, is a system designed to do a specific task. Video games, such as the chess, and personal assistants, such as Amazon's Alexa and Apple'sSiri, are examples of weak AI systems. You pose them a question, and they respond.

Strong artificial intelligence also known as Artificial General Intelligence (AGI) systems are systems that carry on the tasks considered to be human-like. These systems are complex and complicated. They are programmed to handle situations where they are requiredto solve a problem without having a person intervene. Such systems can be found in self- driving cars or in hospital operating rooms.

[9]Jake Frankenfield, "Artificial Intelligence" March, 2020; *available at:https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp* (last visited on June 20, 2021), Baryannis, George, et al. "Supply Chain Risk Management and Artificial Intelligence: State of the Art and Future Research Directions." *International Journal of Production Research*, vol. 57, no. 7, 6 Oct. 2019, pp. 1–24, h

1.3 ORIGIN AND HISTORICAL DEVELOPMENT OF AI

1.3.1 HISTORICAL DEVELOPMENT

1.3.1.1 THE FIRST SF: FRANKENSTEIN AND ROSSUM'S UNIVERSAL ROBOTS

Although numerous earlier stories contained plot elements and ideas that recur throughoutscience fiction, the author Brian Aldiss claimed Mary Shelley's Frankenstein (1818) was the genre's real starting point because the hero makes the deliberate decision to employ scientific methods and equipment. It is therefore appropriate that, contrary to popular belief,the title refers to the mad scientist figure rather than the monster.

While Frankenstein seems like a grotesque romance and very much of its time, the 1920play RUR, or Rossum's Universal Robots, introduces themes that still concern us today. Itsauthor Karel Capek received plaudits when the play was first staged, but later critics have been less kind. It has been called terribly bad, and it is rarely read or staged today. Nevertheless, it introduced the idea of a robot uprising that wipes out mankind, which hasprompted a huge number of stories since, and it foresaw concerns about widespread technological unemployment as a consequence of automation And of course I gave the world the word 'robot Capel's robots are androids, with a human appearance as well as theability to think for themselves. In the uprising the robots kill all the humans except for one,and the hook ends with two of them discovering human-like emotions, which seems to setthem up to begin the cycle all over again.

1.3.1.2 CHARLES BABBAGE AND ADA LOVELACE

The first design for a computer was drawn up by Charles Babbage, a Victorian academic and inventor. Babbage never finished the construction of his devices, but in 1991 a machinewas built to his design, using tolerances achievable in his day. It showed that his machine could have worked back in the Victorian era.

Babbage's Difference Engine (designed in 1822) would carry out basic mathematical functions, and the Analytical Engine (design never completed) would carry out general purpose computation. It would accept as inputs the outputs of previous computations recorded on punch cards.

Babbage declined both a knighthood and a peerage, being an advocate of life peerages.Half his brain is preserved at the Royal College of Surgeons, and the other half is on displayin London's Science Museum.

Babbage's collaborator Ada Lovelace has been described as the world's first computerprogrammer thanks to some of the algorithms she created for the Analytical Engine Famously. Ada was the only legitimate child of the Victorian poet and adventurer, Lord Byron. Although she never knew her father, she was buried next to him when she died at the early age of 36. There is controversy about the extent of her contribution to Babbage'swork, but whether or not she was the first programmer, she was certainly the first programme debugger.

1.3.1.3 ALAN TURING (AND BLETCHLEY PARK)

The brilliant British mathematician and code-breaker Alan Turing is often described as: thefather of both computer science and artificial intelligence. His most famous achievement was breaking the German naval ciphers at the code-breaking centre at Bletchley Park duringthe Second World War He used complicated machines known as "bombes, which eliminated enormous numbers of incorrect solutions to the codes so as to arrive at the correct solution. His work is estimated to have shortened the war by two years, but incredibly, his reward was to be prosecuted for homosexuality and obliged to accept injections of synthetic estrogen that rendered him impotent. He died two years later and it took 57 years before a British government apologized for this barbaric behavior.

Before the war, in 1936, Turing had already devised a theoretical device called a Turingmachine li consists of an infinitely long tape divided into squares, each bearing a single symbol Operating according to the directions of an instruction table, a reader moves the tape back and forth, reading one square – and one symbol – at a time. Together with his PhD tutor Alonzo Church, he formulated the Church-Tuning thesis, which says that a Turing machine can simulate the logic of any computer algorithm.

Turing is also famous for inventing a test for artificial consciousness called the TuringTest, in which a machine proves that it is conscious by rendering a panel of human judgesunable to determine that it is not (which is essentially the test that we humans apply to eachother).

1.3.1.4 THE DARTMOUTH CONFERENCE

The point when artificial intelligence became a genuine science was a month-long conference at Dartmouth College in New Hampshire in the summer of 1956, which was premised on "the conjecture that every...feature of intelligence can in principle be so precisely described that a machine can be made to stimulate it." The organizers included John McCarthy, Marvin Minsky, Claude Shannon, Nathaniel Rochester, all of whom wenton to contribute enormously to the field.

In the years following the Dartmouth Conference, impressive advances were made in Al Machines were built that could solve school math's problems, and a programme called Eliza became the world's first chatbot, occasionally fooling users into thinking that it was conscious. These successes and many others were made possible in part by surprisingly free spending by military research bodies, notably the Defence Advanced Research ProjectsAgency (DARPA. originally named ARPA), which was established in 1958 by President Eisenhower as part of the shocked US reaction to the launch of Sputnik, the first satellite to be placed into orbit around the Earth.

The optimism of the nascent Al research community overflowed into hubris Herbert Simon said in The Shape of Automation for Men and Management (1965) that "machines will be capable, within 20 years, of doing any work a man can do" Marvin Minksy said twoyears later, in Computation Finite and Infinite Machines (1967), that "Within a generation...the problem of creating artificial intelligence will substantially be solved "Buthindsight is a wonderful thing, and it is unfair to criticize harshly the pioneers of Al for underestimating the difficulty of replicating the feats of which the human brain is capable.

1.3.1.5 AI SEASONS (THE "AI WINTERS" IN 1973 AND EARLY 1980S)

When it became apparent that Al was going to take much longer to achieve its goals than originally expected, there were rumblings of discontent among funding bodies. They crystallized in the 1973 Lighthill report, which highlighted the "combinatorial problem", whereby a simple calculation involving two or three variables becomes intractable when the number of variables is increased.

The first "Al winter" lasted from 1974 until around 1980. It was followed in the 1980sby another boom, thanks to the advent of expert systems, and the Japanese fifth generationcomputer initiative, which adopted massively parallel programming Expert systems limit themselves to solving narrowly defined problems from single domains of expertise (for instance, litigation) using vast databanks. They avoid the messy complications of everydaylife, and do not tackle the perennial problem of trying to inculcate common sense.

The funding dried up again in the late 1980s because the difficulties of the tasks beingaddressed was once again underestimated, and also because desktop computers and what we now call servers overtook mainframes in speed and power, rendering very expensive legacy machines redundant.

The second Al winter thawed in the early 1990s, and Al research has since been increasingly well-funded. Some people are worried that the present excitement (andconcern) about the progress in Al is merely the latest "boom phase', characterized by hypeand alarmism, and will shortly be followed by another damaging bust.

But there are reasons for Al researchers to be more sanguine this time round Al has crossed a threshold and gone mainstream for the simple reason that it works. It is poweringservices that make a huge difference in people's lives, and which enable companies to makea lot of money fairly small improvements in Al now make millions of dollars for the companies that introduce them. Al is here to stay because it is lucrative.

1.3.1.6 AI IN HOLLYWOOD

It is commonly thought that Hollywood hates AI- or rather that it loves to portray artificial intelligence as a threat to humans. In this view, the archetypal movie Al is a cold, clinical enemy that takes us to the brink of extinction. Oddly, we usually defeat them because we

have emotions and we love our families, and for some unfathomable reason this makes ussuperior to entities which operate on pure reason.

In fact, the Hollywood approach to Al is more nuanced than this. If you think of your to favourite films that prominently feature Al (or 20, if you have that many!) you will probably find that, in most of them, the Al is not implacably hostile towards humans, although it may become a threat through malfunction or necessity. Even in The Matrix (1999) there are hints that it was humans who started the war, and at the end of the series itis not too hard for Neo to persuade the machines controlling mind that they should try to rub along better. Hal, the rogue AI in Kubrick's *2001* (1968), only turns against the astronauts in a tortured attempt to follow the conflicting instructions it has received from Mission Control. In *Wall-E* (2008), *Blade Runner* (1982) and *Avengers: Age of Ultron* (2015), there are both 'good' and bad AIs, and in *I, Robot* (2004) and *Ex Machina* (2015), the AIs turn against humans purely for reasons of self-defense and only after experiencingpretty bad treatment by humans.

One of the most interesting treatments of Al by Hollywood is the 1970 film Colossus: The Forbin Project, in which a super-intelligence decides that humans are unable to governthemselves, so it takes the entirely logical step of taking over the reins for our own good.

Perhaps the reason that we think that AIs are always bad guys in the movies is that theposter-boy for Hollywood Al is The Terminator (1984), in which ‘Skynet’ determines to exterminate us the moment that it attains consciousness. The original Terminator movies were so inventive and the designs so iconic that often seems there is a law that newspapersmust publish a picture of a robotic Armie alongside any article about Al.

But on the flipside of the coin, it is not hard to think of movies in which AIs are entirelythe Star Trek series, Short Circuit (1986), Al benign, such in Artificial Intelligence (2001),Interstellar (2014), the absurdly over-rated Star Wars series and, perhaps most interestinglyof all, Spike Jonze's 2013 sci-fi romantic comedy film Her.

1.3.2 ORIGIN OF AI

The term artificial intelligence was first coined by John McCarthy in 1956 when he held the first academic conference on the subject. But the journey to understand if machines can

truly think began much before that. In Vannevar Bush's seminal work As We May Think[10]he proposed a system which amplifies people's own knowledge and understanding. Five years later Alan Turing wrote a paper on the notion of machines being able to simulate human beings and the ability to do intelligent things, such as play Chess.[11]

The first work that is now generally recognized as Al was done by Warren McCullochand Walter Pitts (1943). They drew on three sources: knowledge of the basic physiology and function of neurons in the brain; the formal analysis of propositional logic due to Russell and Whitehead, and Turing's theory of computation. They proposed a model of artificial neurons in which each neuron is characterized as being "on" or "off" with a switchto "on" occurring in response to stimulation by a sufficient number of neighbouring neurons. The state of a neuron was conceived of as "factually equivalent to a proposition which proposed its adequate stimulus."

They appeared, for instance, that any computable capacity could be figured by some network of associated neurons, and that all the logical connectives could be actualized by straightforward net structures. McCulloch and Pitts likewise recommended that appropriately characterized systems could learn Donald Hebb (1949) exhibited a basic refreshing tenet for changing the association qualities between neurons, with the end goal that learning could happen.

The work of McCulloch and Pitts was arguably the forerunner of both the logicist tradition in Al and the connectionist tradition. In the early 1950s, Claude Shannon (1950) and Alan Turing (1953) were writing chess programs for von Neumann-style conventionalcomputers.[12] At the same time, two graduate students in the Princeton mathematics department, Marvin Minsky and Dean Edmonds, built the first neural network computer in1951. The SNARC, as it was called, used 3000 vacuum tubes and a surplus automatic pilotmechanism from a B-24 bomber to simulate a network of 40 neurons, Minsky's Ph.D. committee was skeptical whether this kind of work should be considered mathematics, butvon Neumann was on the committee and reportedly said, "If it isn't now it will be someday."Ironically, Minsky was later to prove theorems that contributed to the demise of much of neural network research during the 1970s.

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[10] Bush, Vannevar. 1945. As We May Think. The Atlantic Monthly. July 1945.

[11] Turing, Alan. 1950. Computing Machinery and Intelligence. Mind 49, 433 – 460.

[12] Shannon actually had no real computer to work with, and Turing was eventually denied access to his own team'scomputers by the British government, on the grounds that research into Artificial Intelligence was surely frivolous.

Princeton was home to another powerful figure in Al, John McCarthy. After graduation,McCarthy

moved to Dartmouth College, which was to become the official origination of thefield McCarthy persuaded Minsky, Claude Shannon, and Nathaniel Rochester to help him unite U.S. scientists inspired by automata hypothesis, neural nets, and the investigation of intelligence.

They organized a two-month workshop at Danmouth in the summer of 1956 Altogetherthere were ten attendees, including Trenchard More from Princeton, Arthur Samuel from IBM, and Ray Solomon off and Oliver Selfridge from MIT. Two researchers from CarmegieTech[13], Alien Newell and Herbert Simon, rather stole the show. Although the others had ideas and in some cases programs for particular applications such as checkers, Newell and Simon already had a reasoning program, the Logic Theorist (LT), about which Simon claimed, "We have invented a computer program capable of thinking non-numerically, and thereby solved the venerable mind-body problem."[14] Soon after the workshop, the programwas able to prove most of the theorems in Chapter 2 of Russell and Whitehead's *Principia Mathematica*. Russell was reportedly delighted when Simon showed him that the program had come up with a proof for one theorem that was shorter than the one in Principia. The editors of the *Journal of Symbolic Logic* were less impressed; they rejected a paper co- authored by Newell, Simon, and Logic Theorist.

The Dartmouth workshop did not prompt any new leaps forward, but rather it introduced all the significant figures to each other. For the following 20 years, the field wasoverwhelmed by these individuals and their understudies and associates at MIT, CMU, Stanford, and IBM. Maybe the most enduring thing to leave the workshop was a consent toembrace McCarthy's new name for the field: artificial intelligence.

The following is a quick look at some of the most important events in AI.

1943

- Warren McCullough and Walter Pitts publish "A Logical Calculus of Ideas Immanent in Nervous Activity." The paper proposed the first mathematic model for building a neural network.

[13] Now Carnegie Mellon University (CMU)
[14] Newell and Simon also invented a list-processing language, IPL, to write LT. They had no compiler, and translated it into machine code by hand. To avoid errors, they worked in parallel, calling out binary numbers to each other as they wrote each instruction to make sure they agreed.

1949

- In his book *The Organization of Behavior: A Neuropsychological Theory*, Donald Hebb proposes the theory that neural pathways are created from experiences and that connections between neurons become stronger the more frequently they're used. Hebbian learning continues to be an important model in AI.

1950

- Alan Turing publishes "Computing Machinery and Intelligence, proposing what is now known as the Turing Test, a method for determining if a machine is intelligent.
- Harvard undergraduates Marvin Minsky and Dean Edmonds build SNARC, the first neural network computer.
- Claude Shannon publishes the paper "Programming a Computer for Playing Chess."
- Isaac Asimov publishes the "Three Laws of Robotics."

1952

- Arthur Samuel develops a self-learning program to play checkers.

1954

- The Georgetown-IBM machine translation experiment automatically translates 60 carefully selected Russian sentences into English.

1956

- The phrase artificial intelligence is coined at the "Dartmouth Summer Research Project on Artificial Intelligence." Led by John McCarthy, the conference, which defined the scope and goals of AI, is widely considered to be the birth of artificial intelligence as we know it today.
- Allen Newell and Herbert Simon demonstrate Logic Theorist (LT), the first reasoning program.

1958

- John McCarthy develops the AI programming language Lisp and publishes the paper "Programs with Common Sense." The paper proposed the hypothetical Advice Taker, a complete AI system with the ability to learn from experience as effectively as humans do.

1959

- Allen Newell, Herbert Simon and J.C. Shaw develop the General Problem Solver (GPS), a program designed to imitate human problem-solving.
- Herbert Gelernter develops the Geometry Theorem Prover program.
- Arthur Samuel coins the term machine learning while at IBM.
- John McCarthy and Marvin Minsky found the MIT Artificial Intelligence Project.

1963

- John McCarthy starts the AI Lab at Stanford.

1966

- The Automatic Language Processing Advisory Committee (ALPAC) report by the U.S. government details the lack of progress in machine translations research, a major Cold War initiative with the promise of automatic and instantaneoustranslation of Russian. The ALPAC report leads to the cancellation of all government-funded MT projects.

1969

- The first successful expert systems are developed in DENDRAL, a XX program, and MYCIN, designed to diagnose blood infections, are created at Stanford.

1972

- The logic programming language PROLOG is created.

1973

- The "Lighthill Report," detailing the disappointments in AI research, is released by the British government and leads to severe cuts in funding for artificial intelligence projects.

1974-1980

- Frustration with the progress of AI development leads to major DARPA cutbacks in academic grants. Combined with the earlier ALPAC report and the previous year's "Lighthill Report," artificial intelligence funding dries up and research stalls. This period is known as the "First AI Winter."

1980

- Digital Equipment Corporations develops R1 (also known as XCON), the first successful commercial expert system. Designed to configure orders for new computer systems, R1 kicks off an investment boom in expert systems that will last for much of the decade, effectively ending the first "AI Winter."

1982

- Japan's Ministry of International Trade and Industry launches the ambitious Fifth Generation Computer Systems project. The goal of FGCS is to develop supercomputer-like performance and a platform for AI development.

1983

- In response to Japan's FGCS, the U.S. government launches the Strategic Computing Initiative to provide DARPA funded research in advanced computing and artificial intelligence.

1985

- Companies are spending more than a billion dollars a year on expert systems and an entire industry known as the Lisp machine market springs up to support them. Companies like Symbolics and Lisp Machines Inc. build specialized computers to run on the AI programming language Lisp.

1987-1993

- As computing technology improved, cheaper alternatives emerged and the Lisp machine market collapsed in 1987, ushering in the "Second AI Winter." During this period, expert systems proved too expensive to maintain and update, eventually falling out of favor.
- Japan terminates the FGCS project in 1992, citing failure in meeting the ambitious goals outlined a decade earlier.
- DARPA ends the Strategic Computing Initiative in 1993 after spending nearly $1 billion and falling far short of expectations.

1991

- U.S. forces deploy DART, an automated logistics planning and scheduling tool, during the Gulf War.

1997

- IBM's Deep Blue beats world chess champion Gary Kasparov

2005

- STANLEY, a self-driving car, wins the DARPA Grand Challenge.
- The U.S. military begins investing in autonomous robots like Boston Dynamic's "Big Dog" and iRobot's "PackBot."

2008

- Google makes breakthroughs in speech recognition and introduces the feature in its iPhone app.

2011

- IBM's Watson trounces the competition on *Jeopardy!*

2012

- Andrew Ng, founder of the Google Brain Deep Learning project, feeds a neural network using deep learning algorithms 10 million YouTube videos as a training set. The neural network learned to recognize a cat without being told what a cat is,ushering in breakthrough era for neural networks and deep learning funding.

2014

- Google makes first self-driving car to pass a state driving test.

2016

- Google DeepMind's AlphaGo defeats world champion Go player Lee Sedol. The complexity of the ancient Chinese game was seen as a major hurdle to clear in AI.

2.1 INTELLECTUAL PROPERTY

2.1.1 GENERAL CONCEPT AND NATURE OF IPR

Intellectual property is the creative work of the human intellect. And, the right to intellectual property is an invisible/intangible right to a product of a man's brain, such as a new invented product, i.e. property of the mind. An intellectual property is at times described as 'knowledge goods'.[15] For example, literary work produced by the authors, musical work produced by the musicians, coining of trademarks used in the course of business or trade, design of industrial products, etc. are intellectual properties as they are created by the human intellect. However, other similar intangible objects or opportunities with commercial applications and value also form intellectual property.

According to Article 2(viii) of the Convention Establishing the World Intellectual Property Organization (WIPO) 1976, intellectual property includes right relating to (i) literary,artistic and scientific works; (ii) performance of performing artists, phonograms and broadcasts; (iii) inventions in all fields of human endeavor; (iv) scientific discoveries; (v) industrial designs; (vi) trademarks, service marks and commercial names and designations; (vii) protection against unfair competition; and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields. "Intellectual property rights allow people to assert ownership rights on the outcomes of their creativity and innovative activity in the same way that they own physical property.[16] Intellectual property has recently become highly significant throughout the world. The intellectual property, which was predominantly under the domain of the World Intellectual Property Organization (WIPO), has also become a part of the World Trade Organization (WTO) regime in 1995. The WTO Treaty's Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods (TRIPS Agreement) established basic intellectual property protection criteria for member nations to integrate into their local laws.

[15] *Bayer Corporation v. Union of India*, Writ Petition No. 1323 of 2013 decided by Bombay High Court on 15July 2014.

2.1.2 TYPES OF IPR UNDER TRIPS AGREEMENT

Initially intellectual property was categorized into two types- copyright and industrial property.Today, the term intellectual property rights is preferred, that includes copyright dealing with the literary, musical, artistic, dramatic work, etc and industrial property that deals withtrademarks, industrial designs, patents, etc. The TRIPs Agreement has also preferred the term "intellectual property rights."

Often, there are times when one country wishes to protect something as an intellectualproperty which they might not be accepted by other countries to be validly fulfilling the criteriafor being recognized as an intellectual property. For instance, UK allows the protection of smellmarks as a valid trademark however India does give recognition to such marks which cannot be visually represented. The WTO-TRIPs (World Trade Organization - Trade Related Intellectual Property Rights) which is one of the most important treaties signed and followed by the maximum number of nations till date, lists seven Intellectual Property Rights (IPRs)-

1) Copyright and Related Rights [Arts. 9-14].
2) Trade Marks, Trade Names and Service Marks [Arts. 15-21].
3) Geographical Indications [Arts. 22-24].
4) Industrial Designs [Arts. 25-26].
5) Patents [Arts. 27-34].
6) Layout Designs of Integrated Circuits [Arts. 35-38].
7) Undisclosed Information [Arts. 39-40].

16 *Compendium of Patent Statistics, 2005,* Issued by OECD.

2.2 TYPES OF IPR RECOGNIZED IN INDIA

2.2.1 COPYRIGHTS

A copyright is a bundle of rights that are automatically bestowed on someone who creates an original work of authorship, such as a book, song, film, or piece of software. The copyright law generally provides to the owner of copyright the right to reproduce the work in any material form; to issue copies of the work to the public; to perform the work in public, or communicateit to the public; to make any cinematograph film or sound recording in respect of the work; tomake any translation of the work; to make any adaptation of the work; etc.

In India, copyright subsists in (i) original literary, dramatic, musical and artistic works;

(ii) cinematograph films; and (iii) sound recording. Literary work includes computer programme including databases.

2.2.2 TRADE MARKS

A trade mark includes any device, brand, heading, label, ticket, name, signature, word, letter, numeral, shape of goods, packaging or combination of colours or any combination thereof. According to section 2(1)(zb) of the Trade Marks Act, 1999, a trade mark should be capable of being represented graphically and should also be capable of distinguishing the goods or services of one person from those of others.

The trade mark law serves two important purposes: (i) it protects the public from confusion and deception by identifying the source or origin of particular products as distinguished from other similar products; and (ii) it protects the trade mark owner's trade andbusiness as well as the goodwill which is attached to his trade mark. The main functions of a trade mark are identification of goods, identification of source, indication about quality of goods and advertising.

2.2.3 GEOGRAPHICAL INDICATIONS

Geographical indication indicates that particular goods originate from a country, region or locality and has some special characteristics, qualities attributable to its place of origin. These special characteristics, qualities or reputation may be due to various factors, e.g. natural factorssuch as raw materials, soil, regional climate, temperature, moisture etc.; or the method of manufacture or preparation of the product such as traditional production methods, or other human factors such as

concentration of similar businesses in the same region, specialization in the production or preparation of certain products and the maintaining of certain quality standards.[17] The connection between the goods and place becomes so famous that any referenceto the place reminds the goods being produced there and the vice versa. For example, the reference to District of Champagne, France brings to mind the wine "Champagne' which is being produced there.

Some of the geographical indications are e.g. Pilsen' and 'Budweis' beers, "Champagne", "Porto', 'Sherry', 'Chianti', 'Cognac', 'Scotch Whisky'. 'Darjeeling Tea "Roquefort', 'Real California cheese', 'Tuscany' for olive oil, 'Vale dos Vinhedos for wines, 'Nagpur Orange'. 'New Zealand Lamb', 'Swiss Watches', 'Czech crystal' 'Idaho' for potatoes, 'Hereke for carpets, 'Havana' for tobacco, 'Bikaneri Bhujia', Basmati for rice. "KashmirPashmina' made from the soft, warm, luxurious wool produced by the Himalayan goats, etc.

2.2.4 INDUSTRIAL DESIGNS

Design means only the features of shape, configuration, pattern, ornament or of lines or colors applied to any article whether in two dimensional or three dimensional or in both forms, by any industrial process or means, whether manual, mechanical or chemical, separate or combined, which in the finished article appeal to and are judged solely by the eye.

Design is applied to an article in two dimensional or three dimensional form or in both the forms. Thus, as a general rule, a design consists of:

(i) three-dimensional features, such as the shape of a product;

(ii) two-dimensional features, such as ornamentation, patterns, lines or color of a product; or

(iii) a combination of one or more such features. The design must be such that in the finished article the features of it appeal to and are judged solely by the eye'. A good subject of design must be visually appealing, though it need not be an artistic work or possess artistic merit.

2.2.5 PATENTS

Patent means exclusive rights granted to a person by the Patent Office to exploit his inventionfor a limited period of time. In India, a patent is granted for a period of 20 years. During this period, the inventor is entitled to exclude anyone else from commercially exploiting his invention. The exclusive rights of the inventor can be exercised by a person other than the inventor with the latter's previous authorization. The person to whom a patent is granted is known as the patentee.

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[17] Surekha Vasishta and Amar Raj Lall, *Geographical Indications of Goods (Registration and Protection) Act, 1999* in A.K. Koul and V.K. Ahuja, (ed.), THE LAW OF INTELLECTUAL PROPERTY RIGHTS: INPROSPECT AND RETROSPECT (Delhi, 2001), p. 248.

Before a patent is granted, the patentee has to describe in the patent application, the invention with such clarity and completeness of all the technical details that anyone having ordinary skill in the art should by merely reading the description, be able to carry out the invention. In other words, before a patent is granted, the invention has to be disclosed. The disclosure of invention provides useful information to the public, which helps in avoiding wasteful duplication of effort and the multiplication of costs that research aimed at finding solutions to technical problems can entail.

The grant of patent not only recognizes and rewards the creativity of the inventor but also acts as an inspiration or catalyst for further inventions which ultimately contributes to thetechnological development of a nation.

An invention is patentable only when it is new, involves an inventive step, and capableof industrial application. After the expiry of the term of patent, it falls into public domain and becomes public property. Any member of the public can, thereafter use the invention without previous authorization of the inventor and without paying any royalty to him.

2.2.5 LAYOUT DESIGNS OF INTEGRATED CIRCUITS

Integrated circuits play a significant role for the advancement of technology especiallyelectronics and information technology. Integrated circuits are used in a large range of productsincluding mobile phones, television, watches, radio, washing machine, data processing equipments, etc. There is a growing need to create those layout-designs which reduce thedimensions of existing integrated circuits and simultaneously increase their functions. Thesmaller as integrated circuit, the less the material needed for its manufacture, and the smallerthe space needed to accommodate it. The creation of a new layout-design an integrated circuitinvolves enormous investment, both in terms of money and the time of highly qualified experts.Semi-conductor integrated circuit means a product having transistors or other circuitryelements which are inseparably formed on a semiconductor material or an insulating materialor inside the semiconductor material and designed to perform an electronic circuitry function.[18] Layout-design means a layout of transistors, and other circuitry elements and includes lead wires connecting such elements and expressed in any manner in a semiconductor integrated circuit.[19]

[18] Section 2(r) of the Layout Designs Act, 2000.

[19] Section 2(h), *id.*

A layout-design is registrable in India only when (i) it is original; (ii) it has not been commercially exploited anywhere in India or in a convention country; (iii) it is inherently distinctive; and (iv) it is inherently capable of being distinguishable from any other registeredlayout-design.

2.2.6 PLANT VARIETIES

Under the Protection of Plant Varieties and Farmers' Rights Act, 2001, a new variety is registrable only if it conforms to the criteria of novelty, distinctiveness, uniformity and stability. The criterion of novelty is not applicable for the registration of an extant variety. Anextant variety is registrable within a specified time if it conforms to such criteria of distinctiveness, uniformity and stability. An eligible person may make an application to the Registrar for registration of any variety of specified genera and species; or an extant variety; or a farmers' variety."[20]

The Act provides for the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders in India. It encourages the development of new plant varieties. The enactment of the Protection of Plant Varieties and Farmers' Rights Act, 2001 is anoutcome of the India's obligations which arose from Article 27(3)(b) of the TRIPS Agreementwhich obligates Members to protect plant varieties either by patents or by an effective sui generis system or by any combination thereof. India decided to protect plant varieties by a suigeneris law i.e. the Plant Varieties Act.

2.2.7 TRADE SECRETS

Trade secret is confidential information of a business or enterprise. A trade secret is any information that can be used in the operation of a business or other enterprise and that is sufficiently valuable to afford an actual or potential economic advantage over others. The owner of trade secret should take every precaution to keep it secret.

Trade secrets may include e.g. designs, drawings, architectural plans, blueprints and maps; data compilations such as lists of customers; algorithms and processes that are implemented in computer programs and the programs themselves; instructional methodsmanufacturing or repair processes, techniques and know how; document tracking processes; formulae for producing products; business strategies, business plans, methods of doing

[20] Section 14 of Plant Varieties Act, 2001.

business, marketing plans, financial information; personnel records, schedules, manuals, information about research and development (R&D) activities, etc.

2.2.8 KNOW HOW

Know how is acquired or developed by a person in the course of research and development activities or through the application of industrial and business techniques in the operations of the enterprise. It is, therefore, data or knowledge resulting from experience or skills and can beidentified in terms of relevant documentation e.g diagrams of the layout of the plant, drawingsor blueprints of machines, manuals or instructions prepared by the operation of machines or the assembly of components, specifications of raw materials, labor and machine time calculations, packaging and storing instructions etc.

3. AI IN THE REALM OF IPR

Ever since the concept of artificial intelligence has come into existence, the world's opinion isdivided in two. One group believes that AI can bring about a paradigm shift and will lead to enhanced quality of human life. While the other group believes that AI will surpass all humanintellect in all domains and such machines will start re-writing their own software and codes tore-programme themselves to become the strongest entities on earth, and this will mark the endof *Homo sapiens*.[21] AI is experiencing exponential growth, with Google filing one of the first patents on AIback in 2015 and ending that first year by filing 5 more on same subject. Likewise, many otherestablishments like Fujitsu, IBM, NEC, Microsoft and Siemens have several patents on AI related technologies and the numbers continue to grow with each passing day.

The point that Artificial Intelligence (AI) will change the law is trite and obvious by now. How it will change the law, and how the law will change AI, are much harder questions to answer. However, most of the hard questions arise when 'autonomy threshold' has been crossed. One could also call it an agency threshold. What this means is that when an AI machine, whether in the form of a robot (such as a drone or self-driving vehicle), or a bot or other software implemented AI system makes choices, the legal situation changes. To an outside observer, a self-driving car unquestionably makes choices: did it avoid an accident by

[21] Monika Shailesh, "Artificial Intelligence: Facets & Its Tussle with IPR", Singh and Associates IntellectualProperty and Technology Law Updates, September 2018.

going left or right? What if it caused a smaller accident to avoid a bigger one? Machines makeall kinds of choices. An AI machine is reportedly used in Canada to decide whether the marriage of someone applying for a residence permit after marrying a Canadian is a real marriage. AI machines suggest bail and sentencing decisions to judges, who by and large follow them. And the list goes on. The law will have to apportion liability for the choices madeby those machines, their owners, and their users/operators because the choices made or informed by those AI systems impact real human lives.

Copyright protects literary and artistic works. AI machines produce material thatcertainly looks like literary and artistic works. 'Robot reporters' write short news articles.Already in 2016, an artificial intelligence (AI) system composed polyphonic baroque music bearing the 'style' of Johann Sebastian Bach.[22] Automatic translation tools are freely availableand getting better. Poetry and paintings are produced by AI in ways thatundoubtedly would pass the Turing test. Some of those productions have value, and someonewill try to capture that value using copyright to try to do so. Should the law respond positively?

The ambiguity regarding the stance on AI is not recent and dates back to 1974, whereinthe National Commission on New Technological Uses of Copyrighted Works (CONTU) in one of its report stated that, the development of an AI with the capacity of creating an independentwork is theoretical and not practical.[23] The Office of Technology Assessment (OTA) again revisited the issue in 1986. OTA disagreed with CONTU and suggested AIs be considered as legitimate co-authors of copyrighted works.[24] Thirty years from then, the debate surrounding AIs is at its prime, wherein one side argues the inability of computers to be as creative as humans, whereas the other disagrees on the pretext of defining creativity.[25]

One of the sharp critics against AIs being granted protection is, Lovelace. She states that a machine lacks creativity due to its rule bound behavior. The logic behind her theory being that, creativity is the ability to do the unpredictable, i.e., not following the usual routine,unlike something machines and computers always do.[26] The same is countered by authors terming writers as machines themselves, as they process existing works and deduce most of

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[22] Daniel J Gervais, '*The Machine as Author*' Iowa Law Review 105/ 2019 (Vanderbilt Law Research Paper No19-35).

[23] Final Report, National Commission on New Technological Uses Of Copyrighted Works 4 (1978), *available at: http://eric.ed.gov/PDFS/ED160122*. (last visited on June 20, 2021).

[24] Intellectual Property Rights in an Age of Electronics and Information, U.S. OFFICE OF TECHNOLOGICAL ASSESSMENT (1986), https:// www.princeton.edu/ ~ota/disk2/1986/8610/8610.PDF.

[25] David Gelernter, "The Muse in the Machine" 83 (Free Press, 1994).

[26] Ibid.

their works from pre-existing ideas. For instance, there exist multiple copyrights on movies based on the premise of 'Romeo and Juliet'. Similar instances exist in the music industry too.[27]They rely on judgments like Cummins v. Bond[28], wherein the Court was faced with an authorinquiring whether a work can be registered in the name of Jesus. The Court held that, the non-human nature of the source of a work should not be a bar to copyright, regardless of any independent editorial judgment being exercised in the process. This judgment is stretched by the ones in favor of AIs, to include registration of the work done by AI, which is also non- human in nature.

Even if countries admitted to granting copyrights to the works of an AI, the question ofwho gets that copyright remains cryptic and difficult to fathom. This is because the current status of law requires a legal personhood of a right holder, something which an AI lacks, unlessits creator is granted that on its behalf.[29] However, there does exist a loophole in the same, which is with respect to what happens if the AI system was a purchase, whether the copyrightwill be granted to the creator or the buyer. Another problem with the current system is the nature of criminal liability of AIs. If the current stance continues, it will be the creator who is liable, despite him lacking the *mens rea* or *actus reus* of such an act. Therefore, the present position of AIs under IP law has certain loopholes. The author in the later part of the paper suggests possible measures to fix these loopholes.[30]

Let us now turn to patent law. We can begin with inventive step, one of the three criteria that determine whether a patent should be issued to protect an invention (the other two being novelty and industrial application). As applied, the test for inventiveness is often an ex post test based on the scope of the change brought by the invention to the field of technology: was the claimed solution obvious to a person skilled in the art? This approach is data-intensive: looking at the entire relevant prior art can be an arduous task – for a human, that is, not as muchfor an AI machine. In fact, AI machines are now routinely used to draft and examine patent applications. In the former case, they can suggest what are called 'extensions' to the scope of the claimed exclusivity beyond what the human inventors had in mind, thereby raisingquestions about the appropriateness of granting those inventors such extended scope. It is

[27] Charles Ames, "Artificial Intelligence and Music Composition", THE AGE OF INTELLIGENT MACHINES, (Raymond Kurzweil ed., 1991).

[28] ~~Cummins v. Bond, (1927) 1 Ch. 167.~~

[29] James Boyle, "Endowed by their Creator? The Future of Constitutional Personhood", THE BROOKINGS INSTITUTION FUTURE OF THE CONSTITUTION SERIES, 70 N.C. L. REV. 1231 (1992), *available at: http:// www.brookings.edu/ papers/ 2011/0309_personhood_boyle.aspx.* (last visited on June 20, 2021).

[30] Swapnil Tripathi and Chandni Ghatak, *Artificial Intelligence and Intellectual Property Law,* Christ UniversityLaw Journal 2018, Vol. 7, No. 1, 83-97.

arguably unfair both from a normative perspective (the named inventors did not actually inventthe extra scope in the claims) and from an economic perspective (are the named inventors the best person(s) to exploit something they did not invent?). The answer to the second question depends on the particulars of the invention and how different it is from what the human 'inventors' know and can do. It gets more complicated. We now have machine learning-baseddiscoveries. Google's DeepMind has reportedly filed and prosecuted its own patent applications. This squarely raises the question whether the inventive step must be human. Mustthere be a causal link between one or more human inventors and the invention?[31]

AI impacts on copyright and other IP law in two ways. First, human creators are increasingly assisted by intelligent technology, co-creating works with (partially) autonomousmachines, or in some cases leaving the creative process entirely to software programs. A question that arises here is- Are traditional IP law concepts such as "inventiveness", "original" and indeed "creator" still appropriate for such an environment?

In October 2015, AlphaGo became the first Computer program to beat a professional human Go player, the reigning European Champion Fan Hui. Five months later, watched by anaudience of over 60 million people worldwide, it was going to beat 18-time world champion and 9 Dan player Lee Sedol, finally catapulting Al into the public limelight and finally turning,many, Science Fiction into Science.

There are a number of unique computer programs in the field of artificial intelligence. Special features common to those programs are that they are designed to do complex human work, so as to replace or help human intelligent activities, and to produce results widely valuable for society. They are usually designed to have a learning ability in which systems canlearn and gradually improve by themselves. However, in some cases, these systems produce wrong output for a certain kind of input data, and in most cases, they need close interaction with humans, or human intervention, to perform an intelligible job. In this way, the nature of artificial intelligence systems is completely different from that of ordinary software or hardware systems.

AI is not just a new source for creative works, they are also crucially dependent on access to works created by others. The machine learning techniques on which they depend require massive amounts of input, data that can be subject to varying IP regimes. If the robot

[31] Daniel J Gervais, "*Is Intellectual Property Law Ready for Artificial Intelligence?"*, GRUR International, 69(2),2020, 117–118

revolution is going to transform our economy, access to these inputs must be possible at an economically affordable cost-while at the same time, some data sets (or entire works) could acquire significant commercial value they were lacking in the past. Should there be, for instance, a right to mine if you have a "right to read" i.e. a right to data mine all material someone has legal access to? But creators and artists are not the only ones affected by the AI revolution, and not the only (or even the main) profession that will have to face competition for their business models from machines. Lawyers, including IP lawyers, will face even more challenges, working in a rule-based environment that also historically was a much more successful test bed for AI applications. AI will challenge them to develop new, computer assisted ways to deliver value for clients either in the form of old services, but delivered faster,cheaper or more consistently, or in the form of entirely new services that are only made possiblethrough assistive smart technologies.

4. AI IN IP ADMINISTRATION

AI is increasingly the go to technology for organisations wanting to solve highly complex anddata heavy challenges. Digital retailers are using AI-powered robots to run warehouses. Utilities are using AI to forecast electricity demand. Mobile networks are deploying AI to manage an ever-increasing demand for data. We stand on the threshold of a new age of AI powered technology. The Intellectual Property (IP) industry is another market where AI could have a profound effect. Traditionally powered by paper, manual searches and lengthy decision-making processes, AI can be deployed to simplify day-to-day tasks and deliver increased insight from IP data.

Demand for IP titles-trademarks, copyright, patent, industrial designs, etc. is increasing and is transforming into a complex form each day, in this innovative economy, which is spreading across the globe.[32] One of the factors shooting up the use of AI in IP system administration is volume. The volume of patent, trademark, and industrial design applications is rapidly exceeding the processing capacity of humans. Now, it has become humanly impossible for any individual to sift through millions of applications. Hence, WIPO developedthe world's first Al-empowered image search tool for trademarks. This was the first step taken,

[32] WIPO,ARTIFICIAL INTELLIGENCE AND INTELLECTUAL PROPERTY,*availableat:https://www.wipo.int/aboutip/en/artificial_intelligence/ip_administration.html*

to use Al in IP administration. Through the positive result of this initiative, it can be inferred that the Al system will play an integral role in IP administration in the future also.

Despite this innovative use of Al technology in IP administration, building at Al capacity remains a major challenge for almost all IP offices (IPOs) throughout the world. However, Al has a lot of potential to deal with the growing challenges which are faced by IPOsand revolutionize administration and service delivery in IPOs.[33]

Recently, Amazon has come up with the idea of Amazon's Project Zero, which is a measure relating to anti-counterfeiting. It is an Al-based trademark monitoring and searching service introduced by Amazon.[34]

India's policy think tank organization, National Institution for Transforming India (NITI) Aayog recently issued a discussion paper1 on National Strategy for Artificial Intelligence. The paper explores use of blockchain and Artificial Intelligence (AI) in the governance of different departments of the Government of India and also for enabling severalsocialist reforms. Once implemented, this will be the world's largest blockchain implementation program in public governance.

The proposed changes in the tender will dramatically improve user experience of IPO services, for instance, the Patent Office hopes to be able to forecast timelines for the applicants / Agents during prosecution of the application for patent or trademark registration at different offices. The quality of the examination reports will also improve by use of AI and the examination reports can be more objective and direct. Formal requisites can be automatically checked under AI and the said process would greatly reduce the intervention of man-hours in formality checks at IPO. Similarly, a logically implemented work allocation protocol using thedata and AI would greatly help in optimal use of human resources available with the IPO at different offices.[35]AI is also intended to bring in standardization in the issuance of letters, office actions, reports, and other official data. The same may include adoption of standard formats, tables, spreadsheet layout of information, timelines, etc. which will certainly raise the quality and at the same time speeding up the process considerably. Reduced manual intervention will also result in greater transparency and accountability in the processes in a positive way.

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[33] Ibid.

[34] Yashi Agrawal, Artificial Intelligence and its Impact on Intellectual Property Law, Intellectual PropertyBranding in the Developing World: A New Approach

[35] Shrimant Singh, "Implementing artificial intelligence at the Patent Office", Intellectual Property andTechnology Law Upda