Creativity in crisis: are the creations of artificial intelligence worth protecting?

by **Anthoula Papadopoulou***

Abstract: Up until recently, intellectual creation and inventiveness were purely human activities, and their protection systems, that is, copyright law and patent law, have been built on the basis of motivating and enhancing human creativity. This ancient and self-evident assumption is being challenged due to AI technology today. This article explores the concept of creativity in the field of law from a legal point of view, as well as the impending serious moral and social consequences. In the field of copyright law, intellectual creation is inextricably linked with humans and cannot be replaced by any advanced AI system. This results from the legal definition of work, and in particular from the element of "originality". The Court of Justice of the European Union (CJEU) in its rich case law validates this position. In the field of patent law, ingenuity is also associated with a natural person through the moral right of inventorship. Here, however, the inventor's intellectual endeavor derives from the field of cognition, while fields of human intellect concerning personality in general are not involved in the inventive activity nor are crucial for obtaining a patent. However, it is doubtful whether AI-generated inventions can be protected under patent law for other reasons. Furthermore, decoupling the question of creativity stresses the need for specific legal protection of AI-generated works and inventions. Legislating a sui generis right in order to boost innovation, protect competition and maintain a healthy market for intellectual creations is suggested as the best option.

Keywords: creativity; copyright law; patent law; AI output, legal protection

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A. Introduction

1 Instead of an introduction, we will mention two typical examples that reveal the problem of our study.

> *1st Example:* E-David observes the painting he created and intervenes autonomously by correcting the intensity of the colours or the errors created by the colour dripping. E-David selects the type of brush that will produce the best result and works in an unexpected and creative way. E-David was born about 10 years ago by a research team at the University of Konstanz in Germany.[1]

> *2nd Example:* A research team from the University of Surrey in England submitted applications to the Intellectual Property Office (UKIPO) requesting a patent on two inventions. The first was a new form of beverage container based on fractal geometry, and the second was a device for attracting increased attention during search and rescue operations. Applications for the above inventions were submitted also to the European Patent Office (EPO). The common feature of all applications was that DABUS, an artificial intelligence system, was named as the inventor.[2]

* Associate Professor of Commercial & Economic Law at the School of Law of Aristotle University of Thessaloniki (AUTH).

1 E-David competed with 25 others robots designed by students across the US <www.theguardian.com/artanddesign/2016/apr/19/robot-art-competition-e-david-cloudpainter-bitpaintr> accessed 22 October 2020.

2 The patent applicant and owner of the AI DABUS, Stephen Thaler (USA), has been working with AI for decades. The name

2 These indicative examples reveal the core problems of this article and call into question fundamental assumptions of copyright and patent law. In particular, artificial intelligence systems challenge the concept of creativity on a legal, moral, as well as philosophical level. Creativity—either defined as intellectual creation or as inventiveness—is exclusively connected with the human intellect. Up until recently, intellectual creation and inventiveness were exclusively human activities, and protection systems have been built on motivating and enhancing human creativity. This self-evident and century old assumption is being challenged because of the features modern artificial intelligence systems have. Features that allow some to argue that there is an analogy between human and artificial intelligence and, therefore, the creative output could be protected as an intellectual work or as a patent.

B. Artificial intelligence and creative output

3 Artificial intelligence, as a general targeting technology, covers many scientific and social fields and is difficult to define. Based on a general approach, it could be seen as an attempt to imitate natural or human intelligence that can learn, perceive, process, compose, decide, and provide an output;[3] which, if mediated by the human intellect, we would characterise as a work or an invention. A sub-concept of artificial intelligence, which is essentially the technological key, is machine learning.[4] Machine learning is achieved through adaptive algorithms that can autonomously recognise patterns, interfaces, and technical rules while making them usable. Through machine learning, an artificial intelligence system develops an output/solution on its own, using the trained artificial neural network. Neural networks are not simple algorithms, which are clear rules for solving a problem; rather, algorithms are used as elements of the neural network, which includes synapses and whose function mimics that of the human brain. Neural networks exhibit an intrinsically probabilistic undefined behaviour. They do not solve problems strictly following the rules that have been set; instead, they formulate the solution to a problem based on variable links and the correction factors themselves. In other words, at their current stage, AI systems can learn and improve on their own through trial and error.

4 The result is that the *how* and the *why* of an artificial intelligence output cannot be easily understood from the outside. Nevertheless, the output of an incomprehensible—not only for legal scholars—cognitive computational process based on an external approach, focusing only on the output, could easily be characterised as creative. It is very likely, for example, that a consumer could not distinguish whether a musical composition is the result of human creation or artificial intelligence[5]. In the field of copyright, this is proven by the so-called Alan Turing test for artworks where a behavioural criterion is adopted.[6] To the extent that the creative

"DABUS" stands for "Device Autonomously Bootstrapping Uniform Sensibility <https://legal-patent.com/patent-law/ai-dabus-autonomous-inventor-but-not-official/> accessed 20 October 2020).

3 See, EU Commission, *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: Artificial Intelligence For Europe*, COM(2018) 237 final, at 1: "Artificial Intelligence (AI) refers to systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g., voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g., advanced robots, autonomous cars, drones or Internet of Things applications)." See, among others, Shomit Yanisky-Ravid (2017), "Generating Rembrandt: Artificial Intelligence, Copyright, and Accountability in the 3A Era – The human-like authors are already here- A new model", Mich. St. L. Rev 659, 672; Daniel Schönberger (2018), "Deep Copyright: up – and downstream questions related to artificial intelligence (AI) and machine learning (ML)", in: *Droit d'auteur 4.0/Copyright 4.0*, De Werra, Jacques (ed.), Geneva/Zurich: Schulthess Editions Romandes, pp. 145-173, available at SSRN: <https://ssrn.com/abstract=3098315>, accessed 14 March 2020; Lilian Mitrou (2019), "Data Protection, Artificial Intelligence and Cognitive Services - Is the General Data Protection Regulation (GDPR) 'Artificial Intelligence-Proof'?", available at SSRN: <https://ssrn.com/abstract=3386914>, accessed 15 April 2020; Steven Finley (2018), Artificial Intelligence and Machine Learning for Business A No- Nonsense Guide to Data Driven Technologies, Relativistic, 3rd edition, 2018, 6, 31. Cf. EU Commission: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Building Trust in Human-Centric Artificial Intelligence, Brussels 8.4.2019 COM(2019) 168 final.

4 Ana Ramalho (2018), "Patentability of AI-Generated Inventions: Is a Reform of the Patent System Needed?" < https://ssrn.com/abstract=3168703>, accessed 10 March 2021; Theodoros Chiou (2019), "Copyright lessons on Machine Learning: what impact on algorithmic art?" 10(3) *JIPITEC* 398 para 2 <www.jipitec.eu/issues/jipitec-10-3-2019/5025> accessed 29 May 2020.

5 Shomit Yanisky-Ravid, (n 3) 703.

6 This test asks people which work of art is man-made and which is computer-generated. Once an AI-generated work of art cannot be perceived as such and people cannot tell whether

output can surprise as pleasantly and cause the same enjoyment as if it had been generated by a human being, it does not matter whether the AI is really creative, but whether it appears to be so judging by the outcome.

5 The perception of the output as a creative one by society has its own value for financial scrutiny and integration of these outputs into the market. Nevertheless, the *external approach* to the creative output *does not prejudge the internal approach to creativity.*

C. Artificial intelligence and human creativity

6 The relationship between artificial intelligence and human creativity poses a strong challenge to intellectual property law with strong moral and philosophical attributes.

I. Creativity and intellectual creation in the field of copyright: an exclusive privilege of humans?

7 It is a common assumption, both in the human-centric system of continental law and in the Anglo-Saxon copyright system—which is not obviously human-centric—that creativity goes hand in hand with the spirituality of man.[7] The author of a work can only be a human being as a work can only derive from the human mind. This assumption moreover is the basis of the whole system of protection of moral rights.

8 As an *intellectual creation*, the work can only derive from the human mind. This self-evident assumption on human-centric protection systems[8] has been contested and confirmed by the United States district court in the Monkey Selfie case [9] The case was not about an AI system but instead about the creativity of animals. The question arose as to whether the monkey who used the photographer's camera could be assigned copyright on the photographs. The court ruled that under applicable law copyright cannot be assigned to the monkey and a monkey could not be an author.[10]

9 Further, the *originality* of the work is also linked to human creativity. The legal concept of originality, although it is a very important prerequisite for the definition of work, is not specified by the law. The conceptual framework comes from theory but is mainly provided by jurisprudence.[11] Without further expanding on this topic, let us just note that the dynamic concept of originality moves between a human-centric approach, which puts the individuality of the author at the core, and a work-centric approach, which focuses on the individuality of the work. Today, the position of the Court of Justice of the European Union is of prime importance. By defining the concept of originality as an autonomous

is man-made, it passes the test. *See* Mark Coeckelbergh (2017), "Can Machine Create Art?" 30(3) Philosophy Technology 285, 288 <www.researchgate.net/publication/308535691_Can_Machines_Create_Art> accessed 16 January 2020.

7 In Greek law, human creativity is inherent in the concept of work as a legal term; in particular, a work shall be an *intellectual creation* and have *originality* (Art. 2 Law 2121/1993). For US law, *see* Section 17 U.S.C §102 (1990). *See also*, *U.S Copyright Compendium (third)* §306: 'The U.S. Copyright Office will register an original work of authorship, provided that the work was created by a human being' <www.copyright.gov/comp3/>. accessed 3 October 2020; for English law, CDPA 1988, s 9 (1), Lionel Bently/Brad Sherman, *Intellectual Property Law* (4th ed Oxford University Press 2014) 124; *see also* Ralph Clifford, 'Creativity Revisited' (2018) 59 IDEA - The Law Review of the Franklin Pierce Center for Intellectual Property 25, 26*ff*; Pratap Devarapalli, 'Machine learning to machine owning: redefining the copyright ownership from perspective of Australian, US and EU law' (2018) 40 *EIPR* 722; Shomit Yanisky-Ravid, (n 3) 718; Julia Dickenson, 'Creative machines: ownership of copyright in content created by artificial intelligence applications' (2017) 38 EIPR 457.

8 For French law, *see* André Lucas/Henri-Jacques Lucas, *Traité de la Propriété Littéraire et Artistique* (3rd edn, Lexis-Nexis /Litec 2006), para 143.

9 CA *Naruto v. Slater*, No 16-15469 (9th Cir. 2018) <https://law.justia.com/cases/federal/appellate-courts/ca9/16-15469/16-15469-2018-04-23.html>.

10 CA *Naruto v. Slater*, (n 9); *See also, U.S. Copyright Compendium of U.S* (third) § 306 'The copyright law only protects the fruits of intellectual labor that are founded in the creative powers of the mind. Because copyright law is limited to original intellectual conceptions of the author, the Office will refuse to register a claim if it determines that a human being did not create the work'.

11 Case C-145/10 *Eva-Maria Painer* [2011] EU:C:2011:798, paras 89-93; Case C-5/08 *Infopaq* [2009] EU:C:2009:465, paras 37-45; Cases C-403/08 *Football Association Premier League Ltd and Others v QC Leisure and Others* and C- 429/08 *Karen Murphy v Media Protection Services Ltd* [2011] EU:C:2011:631, paras 97-98; Case C-393/09 *Bezpečnostní softwarová asociace (BSA)- Svaz softwarové ochrany v. Ministerstvo kultury* [2010] EU:C:2010:816, paras 46-49; Case C-161/17 *Land Nordrhein-Westfalen κατά Dirk Renckhoff* [2018] EU:C:2018:634, para 14; Case C- 30/14 *Ryanair Ltd v PR Aviation BV* [2015] EU:C:2015:10, para 34. *See also* André Lucas/Henri-Jacques Lucas, (n 8) para 80, Lionel Bently/Brad Sherman, (n 7) 93 -108.

concept of EU law, the CLJEU has taken a human-centric approach through a series of decisions. In particular, the CJEU identifies originality as the result of the *author's personal intellectual creation*. Basically, the CJEU with its established case law extended the above concept of originality, which had already been legally recognised for three categories of works[12], to all works indiscriminately.[13] Further specifying the concept, it clarified that the intellectual creation of the author occurs when the author is able to make free and creative choices that express their personality.[14]

10 The personal touch with which the author can stamp their work is the result of a complex intellectual process; a process that incorporates mostly the deconstruction of all the elements they receive, the conscious processing of ideas, images, sounds, emotions and senses and finally the composition of the above with a conscious choice, or with a conscious randomness.

11 Questions about the impact of technology on human creativity were raised three to four decades ago because of the so-called computer-generated works. First, the UK incorporated in its copyright law (Copyright, Designs and Patents Act 1988/CDPA) a provision for computer-generated works, i.e., works generated by computer in circumstances such that there is no human author of the work. As provided for by the UK law, an author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.[15] Classifying a computer programme into the category of the *author's tool* became more widely accepted.[16] Simply put, a music software used to create new content represents an asset for the composer as does a camera for a photographer or a brush for a painter. It was a compromise option for integrating computer-generated works into the current legal system ascribing authorship to the individual who coordinates, controls, and possibly intervenes with the result generated by a computer programme.[17]

12 This approach could in principle be applied to works generated with the assistance of artificial intelligence insofar as there is involvement of a natural person (AI-assisted works). The crucial question, however, is the degree of the person's involvement and whether that is enough to ascribe authorship to them. It is claimed that it is not enough if the person simply causes or initiates the process without having control over the output.[18]

13 The essential dilemma then arises with works produced entirely by artificial intelligence (AI-generated works). In the near future, an advanced super-intelligence (ASI) system will have the ability to generate output autonomously, independent of any human involvement. At a legal level, artificial super-intelligence cannot be granted the same status as human creativity and the output it achieves

12 Council Directive 2009/24/EC of 23 April 2009 on the legal protection of computer programs, OJ L 111/16, article 1 par. 3, where reference is made to 'the author's own intellectual creation'; Council Directive 96/9/EC of 11 March 1996 on the legal protection of databases, OJ L 77/20, article 3, where reference is made to, 'by reason of the selection or arrangement of their contents, constitute the author's own intellectual creation'; Council Directive 2006/116/EC of 12 December 2006 on the term of protection of copyright and certain related rights, article 6 of Directive 2006/116, where reference is made to 'the author's own intellectual creation'.

13 See above (n 11).

14 *See* extensively on the concept of originality and creativity through the jurisprudence of the CJEU Thomas Margoni, 'The harmonisation of EU copyright law: The originality standard' in Perry (ed), *Global Governance of Intellectual Property in the 21st Century* (Springer International Publishing 2016), 85-105; Henrik Bengtsson, 'EU Harmonisation of the copyright originality criterion' in Rosén (ed), *European Intellectual Property Law* (Elgar Research Collection 2016), 486-493; Jonathan Griffiths, 'The role of the Court of Justice in the development of European Union Copyright Law' in Stamatoudi/Torremans (eds), *EU Copyright Law- A Commentary* (Edward Elgar 2014), 1102-1104; Mira Sundara Rajan, 'The attribution right: authorship and beyond', in Brison/Dusollier/Janssens/Vanhees (eds), *Moral Rights in the 21st Century*, ALAI Congress Brussels 17-20 September 2014 (Group Larcier 2015), 246-248; Lionel Bently/Brad Sherman, (n 7) 100-102; Irini Stamadoudi, 'The originality in the European Union's copyright law' (2016) 13 *DIMEE*, 49 (in Greek); Stef van Gompel, 'Creativity, autonomy and personal touch: A critical appraisal of the CJEU's originality test for copyright' in M. van Eechoud (ed), *The work of authorship* (Amsterdam University Press 2014).

15 CDPA 1988, s 9(3): 'In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken'.

16 Ana Ramalho, 'Will robots rule the (artistic) world? A proposed model for the legal status of creations by artificial intelligence systems' (2017) Journal of Internet Law 2 <doi:10.2139/ssrn.2987757> , accessed 8 April 2020, Mark Perry and Thomas Margoni, 'From music tracks to Google Maps: Who owns computer-generated works?' (2010) 26 CLSR 621.

17 The question of originality, however, which goes hand in hand with that of human creativity, had not been convincingly answered, Toby Bond/Sarah Blair, 'Artificial Intelligence &copyright: Section 9(3) or authorship without an author' (2019) 14 JIPLP 423.

18 Anne Lauber-Rönsberg/ Sven Hetmank, 'The concept of authorship and inventorship under pressure: Does artificial intelligence shift paradigms?' (2019) 14 JIPLP 570.

cannot be equated with artworks worthy of copyright.[19] There is no doubt that artificial intelligence can successfully mimic or prove to be superior to a part of the human brain: specifically, the part that deals with the analysis and synthesis of knowledge, rules and principles, complex calculations, as well as drawing conclusions or results. However, other brain functions that are less understood have not yet become part of machine learning, such as inspiration, imagination, consciousness, expression of emotions like love, fear, etc.[20] The free and creative choices that leave the author's personal touch, as established by the CJEU, cannot be equated with random outputs by neural networks despite the superiority of their cognitive ability in relation to humans. Even if we accept that a machine can create an artwork, this does not express anything; it does not have the interiority that originates in a human artwork. Therefore, based on an internal approach, which has moral and philosophical foundations but is also fully reflected in the legal meaning of the work, artificial intelligence's outputs cannot be granted the same status as the works of authorship created by human beings. Further, such a change in their status in the current copyright system would completely undermine the whole foundation of moral rights.

14 The consequences of granting AI-generated outputs the status of copyright-protected works on a moral and social level are deeper and more substantial. Imagine a world where a robot of advanced intelligence recites its own poems after having devoured all of Elytis's poems[21] as data or posts news on the internet by selecting headlines based on the criteria of an algorithm.[22] At the same time, imagine a society that has easy and cheap access to mass-produced culture.[23] In such an inflationary context where works of human creation cannot be distinguished from AI-generated works, it is very likely—based on supply and demand—that the human creator's remuneration may be minimal and thus humans may lack the economic incentive to create. In this very same context, the influence of a creator's ideas, views, aesthetics and feelings on the public will fade. Undermining the communication between the creator and the public also minimises the moral motivation of creation. Taking into account that literature, art, science and culture in general have the power to shape consciences and societies, it is not difficult to imagine that if the multitude of AI outputs outlive the creations of the human intellect, there will be societies that will bear the imprint of the outputs of neural networks and perhaps of the users who control those networks.

15 It is clear that AI-generated outputs should not be granted the same status as copyright works. However, as we will see, AI-generated outputs deserve some protection by establishing sui generis right.

II. Creativity and ingenuity in the field of patent law: an exclusive privilege for humans?

16 In the field of technical creations, creativity takes the specific form of ingenuity and inventiveness.[24] Similar concerns arise in the case of an AI system's inventive activity that produces an output worthy of a patent.[25] As in the field of copyright, the dilemma concerns the AI-generated inventions and not the

19 For proponents that artificial intelligence can be equated with the concept of creativity, *see* Shomit Yanisky-Ravid, (n 3) 78 *ff.*, who mentions ten features that an AI system may have with the current level of development which justify the element of "creativity"; among them, she mentions autonomous and independent operation, unpredictable and new outputs, the ability to learn and self-improve/self-develop, the rational system of receiving and processing information, and selecting the best result in relation to its orientation (e.g. creating drafts, writing stories, composing music, etc.).

20 On the philosophical critique of whether machines can create art, *see* David Gunkel, 'Special Section: Rethinking Art and Aesthetics in the Age of Creative Machines' (2017) 30 Philosophy &Technology 263.

21 Odysseus Elytis (1911-1996) was one of the greatest Greek poets of modern Greece. He was awarded the Nobel Prize in Literature in 1979. He was a major exponent of romantic modernism in Greece.

22 Extensively on the issue of automated journalism based on algorithms, Seth Lewis, et al. 'Libel by Algorithm? Automated Journalism and the Threat of Legal Liability' (2019) 96 Journalism and Mass Communication Quarterly, 60.

23 Using the words of Konstantinos Daskalakis, Professor at MIT: 'No, a computer cannot yet write Shakespeare, however, a modern algorithm can learn superb English and imitate the style of the British author' *H Kathimerini* (Athens 22.1.2020) <www.kathimerini.gr/1057253/article/epikairothta/ellada/k_daskalakis-> accessed 5 February 2020

24 The law of technical inventions encompasses, in addition to patents, utility models, plant creation certificates, etc.

25 Oliver Baldus, 'A practical guide on how to patent artificial intelligence (AI) inventions and computer programs within the German and European Patent System: much ado about little' (2019) 41 EIPR 750; Peter Blok 'The inventor's new tool: artificial intelligence – how does it fit in the European Patent System?' (2017) 39 EIPR 69; Erica Fraser, 'Computers as Inventors - Legal and Policy Implications of Artificial Intelligence on Patent Law' (2016) 13(3) SCRIPTed 305.

AI-assisted inventions. Can an artificial intelligence system be an inventor? In the aforementioned example of works created by an AI system, the patent applications were rejected by both the Intellectual Property Office (UKIPO)[26] and the European Patent Office (EPO)[27] because DABUS was named as the inventor. The argument was the same: under English law and the European Patent Convention (EPC), the term *inventor* refers only to a natural person.[28] Subsequently, UK's Intellectual Property Office (UKIPO) updated its Formalities Manual to state that 'an AI inventor is not acceptable as this does not identify "a person" which is required by law'.

17 Patenting dilemmas are less intense because in the technological field of inventions, the inventor's intellectual processes to achieve an innovation are derived from the field of cognition: i.e., the ability to synthesise and analyse data, process and solve problems. In contrast, imagination, emotions or choices that suggest the inventor´s personality are neither required for an inventive activity nor are crucial for obtaining a patent. In other words, the invention is evaluated by objective criteria which do not consider who and how the innovation occured, nor if it expresses the personality of the inventor. In this sense alone, *the ability to invent* could be replaced by the cognitive ability of an artificial intelligence system.

18 However, there is also the parameter of the moral right of inventorship. Under generally applicable law, both nationally and internationally, it is necessary that the natural person who made the invention be named in the application, to ascribe inventorship. If attribution of inventorship is treated as a formal requirement, it can be surpassed by the fictional naming of a natural person, e.g., the system user. Besides, based on the principle of the *first declarant* (art. 63 par. 3 Munich Convention), the one who submits the application is presumed to be the inventor without any further examination.[29] This choice, however, would be morally reprehensible because the strict application of this legal principle which requires a person as an inventor will simply lead companies to formally or fictitiously provide a person's name in order to obtain the patent. This would be unfair: not, of course, for the artificial intelligence system that has no acknowledgement interest but because it would allow people to get credit for inventions they have not made and would devalue human creativity. It would put on an equal footing the person who just poses a question to a robot—and the robot solves the problem—with the person who is really striving to devise an invention.[30]

19 The problem, therefore, is mainly moral and social. The gradual replacement of the inventor by artificial intelligence could lead to the decay of human inventiveness and ingenuity with everything that this may imply in the evolution of the human spirit.

D. Is legal protection for an output generated by an artificial intelligence system justified?

20 This issue needs to be explored primarily in economic terms and in terms of protecting competition, detached from the above thoughts on human creativity. The impact of AI technology on competition law, although of particular importance, has not yet been included in the World Intellectual Property Organization (WIPO) questionnaire.[31]

I. Creative outputs in the field of art, literature and science

21 In the field of intellectual creation and copyright, the question first arises as to whether AI generated creative outputs deserve legal protection. The answer is positive. Refusal to protect could encourage

26 UKIPO patent decision BL O/741/19 of 4 December 2019 <www.ipo.gov.uk/p-challenge-decision-results/p-challenge-decision-results-bl?BL_Number=O/741/19> accessed 26 August 2020.

27 EPO publishes grounds for its decision to refuse two patent applications naming a machine as an inventor <www.epo.org/news-issues/news/2020/20200128.html> accessed 20 September 2020.

28 There was a further problem as to DABUS' ability to own legal rights. In these patent applications, DABUS was designated as the inventor, while Dr. Stephen Thaler (the DABUS developer) was named as the applicant. The Office challenged how the applicant could derive any rights to the invention from the inventor when "an artificial intelligence machine [the inventor] cannot own property rights". Without being entitled to own such legal rights, artificial intelligence machines cannot be considered to transfer any legal rights to the owner or applicant of a patent filing, even if it is acknowledged that the AI created the invention.

29 Moreover, as reported, the European Patent Office does not verify the name of the natural person who is declared as the inventor, Anne Lauber-Rönsberg/ Sven Hetmank, (n 15) 572.

30 Ryan Abbot, 'The Artificial Inventor Project' (2019) WIPO Magazine 1, 3 <www.wipo.int/wipo_magazine/en/2019/06/article_0002.html>.

31 WIPO, 'WIPO Conversation on Intellectual Property (IP) and Artificial Intelligence' (2020) WIPO/IP/AI/2/GE/20/1 Rev. 3 <www.wipo.int/edocs/mdocs/mdocs/en/wipo_ip_ai_2_ge_20/wipo_ip_ai_2_ge_20_1_rev.pdf> accessed 29 May 2020.

parasitic competition which is not justified. Imagine a market where intellectual property and artificial intelligence coexist and only human creations are protected. Based on the above hypothesis, a scenario could be that artificial intelligence outputs imitate with absolute fidelity the style of well-known artists without, however, copying works, which results in consumer confusion and encourages parasitic competition. Once a work or an AI-generated output is exploited, it is on a market, which would thus justify applying competition law. In any case, the perception of the AI output as a creative one by the average consumer combined with the expectedly low price compared to human creations of art could possibly create conditions of unfair competition and consumer deception. For the above reasons, there is a need for a *specific legal protection* of creations generated by artificial intelligence. Recognition of specific legal protection will contribute to the proper functioning of competition rules while preserving the value of human creativity.

22 The question raised then concerns the type of protection provided. Can the protection of AI-generated creative outputs be integrated into the copyright or related rights protection system? Based on a relevant questionnaire set by WIPO[32] and other international forum, such as International Association for the Protection of Intellectual Property (AIPPI) to national delegations, opinions vary.[33] Although no one denies the need for protection, the majority accept the aforementioned possibility of copyright protection only under the condition of the involvement of the human factor (AI-assisted works), referring to the tool's theory.[34] On the contrary, if the creative output is autonomous, unpredictable and there is no human intervention, protection is not admitted under copyright law.[35] Regarding AI-generated works, the absence of any human intervention completely excludes the CJEU requirement for the author's personality expression through voluntary choices. The establishment of a new sui generis economic right could ensure the necessary specific legal protection for these works, as well as reinforce investment without pressuring and deconstructing concepts such as originality and creativity.[36] Moreover, the scenario of granting AI outputs the same status as works of authorship raises the risk that we will be led to a normality of creating works by algorithms, resulting in confusion of the "originality" of human-made works with the endless diversity of AI outputs. In theory, all possible uses of a work (reproduction, distribution, communication to the public, etc.) are also ways of using and exploiting AI-generated outputs. Therefore, a number of relevant property rights are possible, but for a shorter period of protection. It is also important to point out the non-obvious difference in the consumers' perception of the origin of a work.

II. Creative outputs in the field of inventions

23 The need to protect AI-generated inventions is rooted in the European Union's policy of strengthening and promoting technology and innovation. Europe must compete with the United States and China in the development of innovative technologies. In February 2020, the European Commission issued the *White Paper on Artificial Intelligence: (A European approach to excellence and trust)*[37], while in September 2020 the Committee of Legal Affairs issued the *Report on Intellectual Property Rights for the development of artificial intelligence technologies*.[38] Clearly, the EU's strategy for AI is much broader than the perspective on the issues we are addressing. It reaches many areas of our lives which it aspires to change, such as health care (e.g., allowing for more diagnostic accuracy that facilitates better disease prevention), increasing the efficiency of agriculture, mitigating climate change, enhancing the efficiency of

32 WIPO, (n 28) 7-8.

33 Jonathan Osha et al., '2019-Study Question- Copyright/Data Copyright in artificially generated works' (2019) Summary Report AIPPI <www.aippi.dk/wp-content/uploads/2019/05/Study-Guidelines_Copyright_Copyright-in-artificially-generated-works_22January2019.pdf> accessed 20 December 2019.

34 AIPPI, 'Resolution 2019 - Study Question, Copyright in Artificially generated works' (2019) <www.aippicanada.org/wp-content/uploads/2019/12/Resolution_Copyright_in_artificially_generated_works_English.pdf> accessed 11 May 2020.

35 In the context of US law, the view has been expressed that the element of creativity could be recognised to artificially generated works and their protection should remain in the field of copyright through the model of works created by an employee or contractor as an object of work or project, Shomit Yanisky-Ravid, (n 3) 707.

36 Anne Lauber-Rönsberg/ Sven Hetmank, (n 15) 576-577, where the options for legal treatment of artificial intelligence creative outputs are presented extensively.

37 European Commission, *White Paper on Artificial Intelligence: A European approach to excellence and trust* COM (2020) 65 final <https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf> accessed 29 June 2020.

38 European Parliament, Committee on Legal Affairs, *Report on Intellectual Property Rights for the Development of Artificial Intelligence Technologies/Opinion of the Committee on Culture and Education 2020/2015* (INI) <www.europarl.europa.eu/doceo/document/A-9-2020-0176_EN.html> accessed 11 October 2020.

production systems, etc. Self-evidently, the political interest is great, as is the financial support that will be allocated.[39]

24 The correct legal framework for protecting AI-generated inventions is still in question. Protection within the current legislative system of patent law is problematic, although as stated before, ingenuity is evaluated objectively and, therefore, the involvement of the human inventor may not be of interest in a future legislation.[40] In the context of the ongoing WIPO conference, the possibility of having patent or some other certification without having a paternity attribution to a person is under consideration.[41]

25 However, other crucial issues arise in connection with obtaining a patent. It is well known that a key element in a patent application is the description of the invention in a way that the average expert in the art can understand and apply it.[42] As mentioned above, the *how* and *why* in the operation of an artificial intelligence system is opaque. An artificial intelligence system incorporates special features of many technologies and, by working in combination, they become complex, unpredictable and behaviourally autonomous. As a result, the operation of artificial intelligence leading to the output or invention becomes unclear (black box effect).[43] Given this, it is difficult to describe the invention in the patent application in such a way that it is possible for the average expert in the art to put the invention into practice.[44] Might it be enough to disclose the original algorithm? The clear disclosure of the steps taken for the final result is an essential precondition for obtaining a patent; it restablishes the social legitimacy of patents to the extent that the disclosure contributes to the sharing of knowledge and technological development.[45]

26 Concern is also raised by the required element of *inventive step,* meaning that the invention must not not be obvious *to* for an average expert given the current state of the art.[46] This condition is subject to reconsideration, if we place it within the field of artificial intelligence. Who becomes the average expert? What is obvious? Is it evaluated based on cognitive power of the artificial intelligence rather than humans? Or could the person, training artificial intelligence with data, be taken as a reference measure? Moreover, the *level of technique* is reversed at much shorter intervals because the human speeds of evolution will be overturned. Unprecedented velocity will be imposed, and the issue of short-term devaluation of an invention will arise as the cycles of innovation become shorter. In much less than 20 years, the increasingly well-trained artificial intelligence will make the next technological leap in every field. This leads to an inflation of technological advances which is doubtful whether it also justifies patent inflation.[47]

27 Based on the above, AI-generated output protection under the applicable patent law is difficult and problematic. On the contrary, the need to protect AI-generated inventions is achieved by the recognition of a specific *sui generis right.* A sui generis property right, of shorter duration, adapted to the characteristics of artificial intelligence would be the best option.[48] The suggested sui generis right should provide the power

39 *White Paper* (n 37), 25: 'AI is a strategic technology that offers many benefits for citizens, companies and society as a whole, provided it is human-centric, ethical, sustainable and respects fundamental rights and values'.

40 According to Ana Ramalho, (n 4) 14: '...there is nothing in the EPC definition of invention that would preclude AI-generated innovations from being considered as "inventions" for purposes of patentability, especially since exceptions to patentability are to be interpreted narrowly'. Regarding whether an AI invention can be patent, the U.S Court in the case *New Idea Farm Equipment Corp. v. Sperry Corp.* 916 F.2d 1561 (Fed. Cir. 1990,) 16 U.S.P.Q.2d 1424 stated that only people conceive ideas and not machines.

41 WIPO (n 28) 4-5.

42 The obligation to describe the invention on which the claims are based is provided for in article 7 par. 4 of Greek Law 1733/87, Michalis-Theodoros Marinos, *Patent Law*, (Law & Economy P.N. Sakkoulas 2013) paras 5.28-5.30 (in Greek).

43 Corinne Cath, 'Governing artificial intelligence: ethical. Legal and technical opportunities and challenges' (2018) Philosophical Transactions of the Royal Society <https://royalsocietypublishing.org/doi/10.1098/rsta.2018.0080> accessed 5 May 2020.

44 Lionel Bently/Brad Sherman, (n 7) 574-576; Ebrahim Tabrez, 'Artificial Intelligence Inventions & Patent Disclosure' (October 31, 2020), Penn State Law Review, 125 (1), 2020 <https://ssrn.com/abstract=3722720> accessed 5 March 2021.

45 This obligation is provided for in Article 83 of the Munich International Convention, in Article 29 par. 1 of the TRIPS Agreement, in Article 5 of the PCT (Patent Cooperation Treaty) and is included in all national legislation.

46 *See,* for example, Art. 5 par. 4 L. 1733/1987 (Greek Patent Law). For Greek law, *see* Michalis -Theodoros Marinos, (n 38) paras 3.65 -3.66. See also Ralph Clifford, (n 7) 36

47 Anne Lauber-Rönsberg/ Sven Hetmank, (n 15) 578.

48 Ana Ramalho, (n 4) 22 -25 accepts protection under applicable law, as far as in all current constructions inventions a human is still, to a greater or lesser extent, involved. She proposes to develop common guidelines between Patent Offices taking account the characteristics of AI-generated output.

and right (e.g., exclusive use, placing on the market, economic exploitation licenses) as well as provide protection against illegal appropriation. Moreover, the non-recognition of adequate legal protection in an AI-generated invention carries the risk of extending their retention as trade secrets resulting in the non-disclosure of information to the public at the expense of knowledge sharing and technological progress.[49] The possibility to maintain a certain artificial intelligence technology as confidential (trade secret) is obviously much greater if it cannot be protected by an exclusive property right.[50] And this is a possibility that does not help the goal of the developing innovation and the dissemination of knowledge.

E. Allocation of rights on creative outputs and liability: a challenging puzzle for legal scholars

28 The allocation of rights on a creative AI-generated output is a matter of particular significance both for determining the person who will enjoy the economic benefits and because this person will be associated with the liability that may arise from illegal acts. The allocation of rights is a challenging puzzle for the legislator.

29 Three categories of persons make significant contributions to the process of operating an artificial intelligence system.[51] First, the *owner* of the artificial intelligence system who is the natural or legal person who has borne the burden of the financial investment. Second, the *developer* or the natural person who creates the artificial intelligence system Usually, there is more than one developer working on a team to create a series of software that are integrated into a neural network with the ability to work in combination. Third, the *user* of the system, that is, the person who enters the data/inputs and trains the system for a reliable output. It is possible that the *user* is the same person as the developer or the owner, but this is not necessary. The user is the last person to intervene in the chain of final and autonomous operation of an AI system.

30 The above three categories of persons involved are common whether the output is a work or an invention. Which category of persons can claim authorship or inventorship? The owner of the system is the person who has invested in the creation of the system. Although this person does not have any involvement in the operation of the system, they must be financially secure in order to recuperate the costs of their investment and to be motivated to invest further in the field of artificial intelligence. Proponents of computational creativity have argued that an artificial intelligence system can be understood as a creator with analogous (or legal) acknowledgement of legal personality in this system.[52] In our view, a sui generis right analogous to that of a database maker could possibly be established in order to secure the investment and avoid a 'market failure' in the absence of legal exclusivity.[53]

31 The developer or—more commonly—the team of developers who work together to develop the software acquire the copyright as authors or co-authors of the computer programme. In particular, the developers are co-authors and initial co-holders of the copyright on the programmes they develop. The property rights assigned to these persons by law or on contractual terms if they work as contractors are granted to the company. They are usually employees of tech companies. Persons, as authors, retain moral rights on software. Developers, however, do not seem to have a reason to be considered authors of the creative output of the system they developed, as the camera manufacturer has no copyright to the photos taken by the photographer.[54] Other ideas have been also suggested, such as to name as co-inventors those who developed the artificial intelligence system along with those who entered the data of the technological problem, that is, the user of the system.[55]

49 WIPO (n 28) 5.

50 Ana Ramalho, (n 4) 23; Ebrahim Tabrez, (n 43) 207.

51 As an option, it is also advocated to classify these creative outputs as free works belonging to public space; *see* Konstantinos Christodoulou, 'Legal Issues from artificial Intelligence' [2019] Chronika idiotikou Dikaiou 330 (in Greek); Anne Lauber-Rönsberg/ Sven Hetmank, (n 15) 577.

52 Anne Lauber-Rönsberg/ Sven Hetmank, (n 15) 577; Konstantinos Christodoulou (n 45) 331, who point out the risks of opacity in relation to natural persons who will have control over the legal entity.

53 Article 45 A par. 1 of Greek Law 2121/1993 which is a transposition of art. 7 par. 1 of Directive 96/9/EC.

54 It has been argued that the creative output can be considered a derivative work of the creator of the program. This view is not consistent with mine to the extent that it does not answer the question of originality/creativity that should also characterise a derivative work. Also, as rightly observed by Konstantinos Christodoulou (n 45) 330 'The technical output achieved with the use of specific software is not a derivative work, even if this output would be a work e.g., a piece of music or a painting generated by creative software'.

55 Anne Lauber-Rönsberg/Sven Hetmank, (n 15) 572.

32 The role of the user of the system seems to be crucial and is the closest to the creative output. It is the person who introduces training data—which may be previous works—and sets the goal. It is the person who controls the result more, in the case of an AI-assisted work, and less (up to a minimum) in the case of an AI-generated output. In the first case we may accept that there is a copyrighted work and the initial copyright holder is the user considering that the artificial intelligence system assumes the role of a *tool*. The choice of training data may be paralleled with the requirement of creative choices set by the CJEU. In the second case, the *user* is the person who theoretically deserves to acquire the sui generis right as the person who entered into the system all the data on the basis of which the system came to the AI-generated creation or work. In fact, what usually happens is that the user is an employee of the company that owns the artificial intelligence system. Therefore, based on the proportional application of the national rules governing works made by hired employment, the sui generis right will be acquired upon assignment by the legal entity that owns the AI system.[56] The same person, the employer's company, should be liable for possible infringements of previous works used as data for system training. Also, it has been expressed that all AI-generated creations potentially fall under the public domain with possibilities to make national rules 'outside' the copyright sphere, e.g., competition law applicable.[57]

33 Regarding an AI-generated invention, the user's role is just as critical. The selection and the quality of data used to train the AI system is of the utmost importance for achieving a good result. The more data, the better the training of the system and the more the chances of achieving a reliable inventive output. Thus, the user's role is the one entailing the necessary ingenuity for the output and, therefore, the user is the person who can theoretically be deemed to be the rightholder of the sui generis right. Often, the user is not a self-employed natural person but an employee of a company and it is very likely that the company owns the AI system. Therefore, the following situation may arise regarding the allocation of a sui generis right: either there will be a proportional application of the national provisions for employees' inventions[58] or the company will acquire the rights following a contractual assignment. An important issue may arise in relation to the allocation of liability for defective new products or methods derived from artificial intelligence. Who is responsible for the safety of new products or methods or, even if there is no question of safety, who is responsible if these products infringe other rights such as, e.g., personal data.[59]

34 It is clear that some legislative initiative will be taken at the EU level so that, in the future, there is a harmonised legal protection of creative outputs in the member states.

F. Concluding thoughts

35 Artificial intelligence has vigorously permeated all areas of social and economic life.[60] An issue such as the impact of artificial intelligence on human creativity cannot be closed nor can conclusions be drawn. Questions and dilemmas remain open.[61] The

56 Under Anglo-Saxon law, it has been argued that the provisions on employees' work could apply proportionally (work for hire), Shomit Yanisky-Ravid, (n 3).

57 Ole-Andreas Rognstad, 'Artificial Intelligence and Copyright-Ownership', in *"EU copyright, quo vadis? From the EU copyright package to the challenges of Artificial Intelligence." ECS International Conference* Brussels, 25 May 2018, as reported by B.G Otero/J.P. Quintais, 'Before the Singularity: Copyright and the Challenges of Artificial Intelligence' <http://copyrightblog.kluweriplaw.com/2018/09/25/singularity-copyright-challenges-artificial-intelligence/> accessed 11 March 2021.

58 Regarding the significant differences in the ways in which the EU member states handle the legal issue of employees' inventions, *see* Marie-Christine Janssens, 'EU Perspectives on Employees' Inventions' (2013), in: M. Pittard, A. Monotti and J. Duns (eds), *Business Innovation and the Law: Perspectives from Intellectual Property, Labour, Competition & Corporate Law*, (Edwards Elgar Publ., Cheltenham, UK, 2013), 113-116, <https://ssrn.com/abstract=2287765> accessed 10 March 2021.

59 White Paper, COM (2020) 65 final, 12: 'Market surveillance and enforcement authorities may find themselves in a situation where they are unclear as to whether they can intervene, because they may not be empowered to act and/or don't have the appropriate technical capabilities for inspecting systems. Legal uncertainty may therefore reduce overall levels of safety and undermine the competitiveness of European companies....' In footnote 36, the White Paper provides the example of the smart watch for children: 'This product may cause no direct harm to the child wearing it, but lacking a minimum level of security, it can be easily used as a tool to have access to the child. Market surveillance authorities may find it difficult to intervene in cases where the risk is not linked to the product as such'.

60 WIPO, 'Artificial Intelligence' 2019 Technology Trends 37 <www.wipo.int/publications/en/details.jsp?id=4386> accessed 11 May 2020, where it is stated that deep learning showed an impressive average annual growth rate of 175 percent from 2013 to 2016 in patent filings.

61 In the summer of 2019, a painting exhibition was held at the University of Oxford by AI-DA, a robot that was awarded female identity, female image and emerged as a creator or artist.

reservations I have expressed have mainly moral and social bases while I pointed out the important legal incompatibilities which differ to some extent between the two scientific fields. There is no doubt that legislative initiatives should be taken at the EU level both for copyright and patent law. Introduction of sui generis solutions are more suitable for European countries' individual legal systems. On the one hand, the interest and value of humans and human creativity must be preserved in every way. On the other hand, regarding AI-generated outputs classified into works or inventions, legal exclusivity must be ensured through sui generis rights. The above option is a clear solution and does not force the existing legal framework to incorporate AI-generated outputs that have different structural characteristics from a work or from an invention arising from the human intellect.