

# YAPAY ZEKÂ ÜRÜNLERİNİN VE SAHIPLİK İKİLEMİNİN FİKRİ MÜLKİYET HUKUKU KAPSAMINDA DEĞERLENDİRİLMESİ

*How IP Struggle to Define Ai-Generated  
Products and the Ownership Dilemma*

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## ÖZ

Fikri Mülkiyet (IP) haklarına ilişkin düzenlemeler, hızla ilerleyen teknolojik gelişmelerle kıyaslandığında yetersiz kalmaktadır. Yapay Zekanın (AI) geliştirilmesi ve yaygın kullanımı, telif hakkı ve patent korumasının sınırlarını zorlamaktadır. Yapay zekanın insan müdahalesi olmadan öğrenme ve çıktı üretme imkanı sebebiyle, yapay zeka tarafından üretilen eserler değerlendirilirken fikri mülkiyet haklarıyla korunma noktasında patentlenebilirlik ve telif hakkı gereksinimlerinin karşılanması hususları belirsizlik yaratmaktadır. Bu makalede, AI'nın telif hakkı ve patent korumasından yararlanabilecek yaratıcı ve özgün çalışmalar ürettiğine dair şüphe olmamasına rağmen, Birleşik Devletler (ABD), Birleşik Krallık (UK) ve Avrupa Birliği'ndeki (AB) fikri mülkiyet haklarının mevcut çerçevesinin açıkça Yapay Zekanın gelişimini değerlendirmede yetersiz olduğu ileri sürülmektedir. Bu çerçevede, yapay zekanın meydana getirdiği özerk eserin müellifi/mucidi ve sahibi kim olacak sorusu ele alınmış ve mevcut düzenlemelerin bu sorunu yeterince cevaplayamadığı sonucuna ulaşılmıştır. Kanaatimizce, yapay zekayı yazar olarak kabul etmek veya etmemek yerine, yapay zeka kaynaklı eserlerin koruma kapsamı belirsizliğini aşmak için bazı yasal düzenlemelerin yapılması gerekmektedir. Yapay zeka zamanla gelişirken, yapay zeka tarafından üretilen eserlerin belirsizlik sorunu çözülmezse, gelecekte bu husus farklı sorunlara baş etmek zahmetli hale gelebilir.

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**Makalenin Geliş Tarihi:** 05.02.2022, **Makalenin Kabul Tarihi:** 28.04.2022.

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### ABSTRACT

Intellectual Property (IP) rights have always had difficulties coping with disruptive technologies. The development of Artificial Intelligence (AI) and its everyday use push the boundaries of copyright and patent protection. The interpretations of patent and copyright requirements for being protected by IP rights become ambiguous when assessing AI-generated works due to the ability of AI to learn and generate output without human intervention. This article, although there is no doubt that AI generates creative and inventive works which could obtain copyright and patent, the existing framework of both IP rights in the United States (US), United Kingdom (UK), and European Union (EU) is insufficient to deal with AI development. This article analyses the question of who the author/inventor and owner of the autonomous work will be and concludes that it does not seem to be answered adequately based on current regulations. The author argues that rather than accepting AI as an author or not, some legal regulations should be made to overcome the uncertainty of AI-generated works' protection scope. While AI develops over time, if the ambiguity problem of AI-generated works is not solved, this may become troublesome in the future.

**Keywords:** Artificial Intelligence, Patent, Copyright, Intellectual Property, Ownership

### I. INTRODUCTION

Due to artificial intelligence (AI) 's continuing growth, the world has entered a new and disruptive era. Research assessing the capabilities of artificial intelligence has indicated that AI will attain half the level of human ingenuity by 2040 and will equal humans in creativity before 2080<sup>1</sup>. For example, Jukedeck<sup>2</sup> and Watson Beat<sup>3</sup> (an algorithm that employs neural

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<sup>1</sup> Paul D Thorn, 'Nick Bostrom: Superintelligence: Paths, Dangers, Strategies', *Minds and Machines* 25, no. 3 (2015): 285–89.

<sup>2</sup> Emma Featherstone, 'Introducing the Next Generation of Music Makers', *The Guardian*, August 29 2017, sec. Guardian Small Business Network, Accessed on September 15, 2019. <https://www.theguardian.com/small-business-network/2017/aug/29/computer-write-music-jukedeck-artificial-intelligence>.

<sup>3</sup> Amelia Heathman, 'IBM Watson Creates the First AI-Made Film Trailer – and It's Incredibly Creepy', *the Wired UK*, September 2, 2016, Accessed on September 15, 2019. <https://www.wired.co.uk/article/ibm-watson-ai-film-trailer>.

networks and can learn) can compose music in seconds from only a few trivial inputs. Aaron might be another example, a machine created by Harold Cohen that uses actual paint to produce works later exhibited in the Tate Museum<sup>4</sup>. There is no doubt that AI generates creative and inventive results. The requirements for copyright protection have been listed in several international treaties: TRIPS Art. 27 states that an invention must be novel, industrially applicable, and inventive to be patentable, while Art. 9-10, quoting the Berne Convention, says that a work must be original and fixed in any tangible medium to obtain copyright protection. However, the interpretation of these terms has been left to national jurisdictions and courts<sup>5</sup>. The ambiguity regarding the understanding of IP rights and terminology in law has been widely criticised for many years. Accordingly, as the law has evolved, various approaches to interpretation have evolved alongside it, depending on the experiences in multiple jurisdictions. However, the IP system has coped with these threats by using basic regulations. The increasing number of autonomous machines and their improved ability to learn and generate output without human intervention poses the most complicated risk to IP regimes thus far. The world is already far ahead of the Turing test. Until the emergence of autonomous machines, it was presumed that creativity derived from the natural person; however, AI challenges this presumption. Even though it needs to be programmed, AI can produce inventions and compose works without any human intervention in the creation process, if not legally.

However, it is unclear how the notion of ‘original intellectual conceptions and the originality criteria applied to human creative output should be used to AI outputs. When discussing patents and copyrights, it is first essential to clarify the difference between AI-aided works and AI-generated works: the protection of works produced by humans using AI is evident<sup>6</sup>. In contrast, that of autonomously AI-generated works is more uncertain. As AI-generated works become increasingly indistinguishable from human creations, the extent of protection requirements, inventorship/authorship and ownership

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<sup>4</sup> William Grimes, 'Harold Cohen, a Pioneer of Computer-Generated Art, Dies at 87', *The New York Times*, May 6 2016, sec. Arts, Accessed on September 15, 2019. <https://www.nytimes.com/2016/05/07/arts/design/harold-cohen-a-pioneer-of-computer-generated-art-dies-at-87.html>.

<sup>5</sup> "The Agreement on Trade-Related Aspects of Intellectual Property Rights", opened for signature April 15, 1994, Art 9-10-27. World Trade Organization. Accessed on September 15, 2019. [https://www.wto.org/english/tratop\\_e/trips\\_e/trips\\_e.htm](https://www.wto.org/english/tratop_e/trips_e/trips_e.htm)

<sup>6</sup> *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 59 (1884).

regarding copyright and patent rights has come into question. The main goal of an IP regime is to foster innovation. Without assigning an inventor or author, it is impossible to protect the work; if the work cannot be protected, the number of AI-based inventions will subsequently decrease, contrary to the main principle of IP, in parallel with public use. Rather than proposing either copyright or patent protection for AI-generated products, this paper instead argues that the current state of IP rights is insufficient to deal with AI development.

This study comprises two themed chapters. The first assesses the subject matter requirements of copyright protection in the United States, the United Kingdom and the European Union, then discusses the proposal of AI authorship and a possible human authorship approach. It subsequently evaluates the ownership problem of AI-generated works and reviews whether the existing copyright system can cope with the emerging AI developments. The second chapter examines whether AI-generated works can adapt to patent protection by considering patentable subject matter standards in the UK, the U.S. and EU. In addition, it will analyse the arguments for and against AI inventorship, how ownership for human inventors might be determined, and the potential applicability of these proposed approaches under different jurisdictions. Finally, the last section contains an evaluation and combination of the preceding paragraphs to assess the current IP regime's role in AI development and how sufficient it is for the task.

## **II. COPYRIGHT**

### **A. Copyright Protection of Artificial Intelligence Inventions**

#### **1. Copyrightability under the United States Copyright Law**

It is defined in the U.S. Constitution that stimulating behaviours useful for the improvement of technology and granting privileges to those who contribute accordingly is the main target of copyright protection<sup>7</sup>. The building blocks of copyright regimes are designated under 102(a) of the U.S. Copyright Act as originality, authorship, and fixation of expression. The Feist decision is seminal for the U.S. copyright regime. It divided the term

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<sup>7</sup> U.S. Constitution, Art. 1, sec. 8, cl. 8.

'originality' into 'independent creation' by the author and 'a modicum of creativity and, in doing so, introduced originality as a criterion of copyright into the U.S. Constitution and added a creativity scale into the law<sup>8</sup>. In contrast to the 'sweat of brow' doctrine implemented in the past, Judge Holmes stated that the requirement of creativity is so simple that it could be fulfilled 'even in handwriting'<sup>9</sup>. AI can be programmed to be creative, producing outputs indistinguishable from those of human authors; moreover, these outputs could be rendered in fixed forms. At this point, it may be asserted that AI-generated works can exceed this creativity limit and are thus original. On the other hand, it is argued that the intellectual features and personality of the author are signs of creativity compared to qualifications that distinguish the aesthetic work. While there is no precise definition of originality, courts have held that the term 'independent creation', which defines originality, refers to the work not being copied from anyone else; thus, there must be a recognisable author<sup>10</sup>. In the U.S. copyright regime, the most challenging aspect of deciding whether computer-generated products are original is assessing the link with the author. Even though there is no clear definition of authorship in the Act, there have been cases interrogating the meaning of 'human beings' or 'persons' before the Supreme Court<sup>11</sup>. *Naruto v. Slater*, which addresses non-human authorship, is one of the most well-known cases in this debate<sup>12</sup>. The 'authorship' of the pictures taken by the monkey was rejected on the ground that non-humans do not have legal personality and are thus unable to sue or be considered authors under copyright law. At present, most legal systems agree that human authorship is enough to solve the problems that may arise. The 'Works That Lack Human Authorship' section of the U.S. Copyright Office's Compendium states that works made by non-human authors are not copyrightable<sup>13</sup>. It was further decided in the Compendium by referring to 'original intellectual conceptions of the author, 'in *Burrow Giles*, that autonomously or randomly generated works composed of mechanical procedures or machines independent of human intervention would not be registrable<sup>14</sup>. Although it is

<sup>8</sup> *Feist Publ'ns, Inc. v. Rural Tel. Serv. Co.*, 499 U.S. 340, 345 (1991).

<sup>9</sup> *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239, 250 (1903).

<sup>10</sup> *Ibid* 8.

<sup>11</sup> *Aalmuhammed v. Lee*, 202 F.3d 1227, 1234 (9th Cir. 2000).

<sup>12</sup> *Naruto v. Slater*, 2016 U.S. Dist. LEXIS 11044 (N.D. Cal. 2016).

<sup>13</sup> United States Copyright Office. "Compendium of US Copyright Office Practices." (2014), § 306. Accessed on September 18, 2019. <https://www.copyright.gov/comp3/>

<sup>14</sup> *Ibid* § 313.2.

not binding, this approach continues to be applied to A.I., as was shown in the last update of Declaration<sup>15</sup>. Under these circumstances, to boost innovation by providing copyright protection in the A.I. sector, the U.S. courts have followed the approach of allocating human authorship to works autonomously generated by computers. On the other hand, in *Urantia Foundation v. Maaherra*,<sup>16</sup> in which non-human authorship was claimed, it was held that the human authorship requirement is not so rigid; as Bridy argues<sup>17</sup>, to protect the copyright, although 'human authorship' is denied by both parties, the courts interpreted that there was a good link with human intellectual creation. Even if AI-generated works that lack human intervention hamper the connection between the originality requirement and authorship, due to the low threshold of creativity, if allocating a human author was possible, the AI-generated work would be copyrightable. However, when the effectivity of A.I. in the output is increased in comparison with human input, and when demonstrating human control over the output becomes infeasible, human authorship claims may weaken. By contrast, the U.S. National Commission on New Technological Uses of Copyrighted Works (CONTU) stated that A.I. is essentially a mere tool and that even the most complicated autonomous programs (with creative learning skills and an ability to use randomness) are bound by the commands issued in their code and the limits of their designers' coordination and users' aims when carrying out specific actions. After the CONTU report, the U.S. Congress Office of Technology Assessment (OTA) asserted that developments have revealed that assuming AI to be a mere tool may be incorrect, as the same outputs would be copyrightable if generated by humans<sup>18</sup>. Today, because of developments in the AI sector, certain copyrightable works in the field of painting, writing and music have been autonomously generated by AI. For instance, the algorithms Wave Net<sup>19</sup> and Watson Beat<sup>20</sup> can compose new music after 'listening' to existing music,

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<sup>15</sup> United States Copyright Office. "Compendium of US Copyright Office Practices." (2017), §101, 313.

<sup>16</sup> *Urantia Found. v. Maaherra*, 114 F.3d 955, 963-64 (9th Cir. 1997).

<sup>17</sup> Annemarie Bridy, 'Coding Creativity: Copyright and the Artificially Intelligent Author', *Stan. Tech. L. Rev.* 5 (2012) 5.

<sup>18</sup> U.S. Office of Technology Assessment (OTA), *Intellectual Property Rights in an Age of Electronics and Information*, (1986) 73. Accessed on September 18, 2019. <https://ota.fas.org/>

<sup>19</sup> Jonathan Balaban, 'How WaveNet Works', Medium, 10 May 2019, <https://towardsdatascience.com/how-wavenet-works-12e2420ef386>.

<sup>20</sup> Heathman (n 3).

while Deep Dream<sup>21</sup> is able to generate new and unique photos without any intervention. Scholars such as Abbott have suggested that scope of ‘authorship’ must thus be extended beyond non-humans, because AI-produced works meet the requirements for legal protection given to exclusively original works<sup>22</sup>. In summary, until new legal regulations are made in the U.S., A.I. will continue to develop and become more complex, increasing the unclear nature of current authorship standards. Likely, the insufficiency of A.I. generated works assessment will review in the regulations of the U.K.

## 2. Copyrightability under the United Kingdom Copyright Law

A work can be copyrightable in the UK if it is original and a result of sufficient skill, labour, or judgment on part of the author. As it can be seen in *Walter v. Lane*, the UK initially adopted the labour theory, which corresponds to the ‘sweat of brow’ approach in the US, to grant copyright by giving protection to scribes who write down speakers’ words<sup>23</sup>. Subsequently, under amendments to the Copyright, Designs and Patents Act 1988 (CDPA), Section 3 (a) states that a database is original if it presents an ‘author’s own intellectual creation’; this decision has expanded to cover all literary works within *Infopaq*<sup>24</sup> and *Painer*<sup>25</sup>. AI-generated works neither comprise human skill and labour nor human intellectual conception, while the difficulty of identifying the author due to the complexity of autonomous works creates the risk of leaving the work unprotected. Computer-generated works have been recognised and defined by the CDPA as works created in the absence of a human author. It seems that the U.K. copyright law has followed the idea that a lack of human authorship is not an obstacle to protecting a work. In *the Express Newspapers* case,<sup>26</sup> the court allocated copyright to the designer by denying the claim that AI-created letter grids were not generated through human creativity. Article 9(3) of CDPA expresses that in terms of computer-

<sup>21</sup> ‘DeepDream|TensorFlow Core’, TensorFlow, accessed 4 August 2020, <https://www.tensorflow.org/tutorials/generative/deepdream>.

<sup>22</sup> Ryan Abbott, ‘I Think, Therefore I Invent: Creative Computers and the Future of Patent Law’, *Boston College Law Review* 57 (2016): 1079, 1100. <https://heinonline.org/HOL/Page?handle=hein.journals/bclr57&id=1080&div=&collection=>.

<sup>23</sup> *Walter v. Lane* [1900] A.C. 539.

<sup>24</sup> *Infopaq International A/S v Danske Dagblades Forening* (C-5/08) EU:C: 2009:465; [2012] Bus. L.R. 102

<sup>25</sup> *Eva-Maria Painer v Standard Verlags GmbH* (C-145/10) ECDR 6.

<sup>26</sup> *Express Newspapers plc v Liverpool Daily Post & Echo plc and Others* [1985] 1 WLR 1089.

generated works, the ‘author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken’. The U.K. approach is ahead of the U.S. and E.U. in terms of categorising AI-generated works and establishing a connection between such works and human authors. Although Article 9(3) of CDPA seems favourable to administrating AI-generated works, the only difference between the U.S. and E.U. implementation is as follows: in the U.S. and E.U., courts are trying to find a nexus between AI-generated works and humans, while in the U.K., it was first accepted that these works are copyrightable, after which courts have tried to ascribe authorship to humans. Moreover, the U.K. approach has been criticised for deviating from the main U.S. and E.U. focus, which puts humans at the centre of copyright protection, and for the originality criteria, which have become unnecessary<sup>27</sup>. It is asserted that the U.K. approach runs contrary to the ‘author’s own intellectual creation’ requirement, in the sense that the identified human authors are not the actual authors of the work<sup>28</sup>. This illustrates that the U.K. amendments are not sufficient to appropriately assess AI-generated works. It illustrates below, the authorship problem concerning the AI is identical to the E.U. law.

### 3. Copyrightability under the European Union Copyright Regulations

Article 2/1 of the Berne Convention<sup>29</sup> does not present any requirements for copyright protection. Regarding computer programs, the Software Directive provides that the only criteria sought are originality, which amounts to the ‘author’s intellectual creation’<sup>30</sup>. Authors are defined under the Computer Program Directive as rights holders or natural persons, as defined in the specific country’s regulations<sup>31</sup>. With the Infopaq decision, the originality

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<sup>27</sup> Andreas Rahmatian, ‘Originality in UK Copyright Law: The Old “Skill and Labour” Doctrine under Pressure’, *IIC-International Review of Intellectual Property and Competition Law* 44, no. 1 (2013): 4,5.

<sup>28</sup> Guadamuz, A. (2017). Do androids dream of electric copyright? Comparative analysis of originality in artificial intelligence generated works. *Intellectual property quarterly*, 169, 176.

<sup>29</sup> World Intellectual Property Organization. (1982). *Berne Convention for the Protection of Literary and Artistic Works: Texts*. Geneva: World Intellectual Property Organization.

<sup>30</sup> "Directive 91/250/EEC of the European Parliament and of the Council of 14 May 1991 for legal protection of computer programs". Art. 1(3). Publications Office of the European Union.

<sup>31</sup> "Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs". Art. 2(1). Publications Office of the European Union.



requirement defined in the Software Directive was expanded to cover all artistic and literary works<sup>32</sup>. The 16th recital of the Term Directive<sup>33</sup> focused on the use of personality to achieve originality; similarly, it is interpreted as ‘personal character’ and ‘creative touch’ in the CJEU Painer<sup>34</sup> and Dataco<sup>35</sup> cases respectively. The general idea is that personal touch and creative choice imply the need for a human author. In Dataco, the court held that there is no personal touch or creativity in AI-generated works, as the instructions are given by technical means<sup>36</sup>. Even though there are variations in the UK, US and EU law, the critical point is the definition of originality related to identifying the author. Although computer-aided works are eligible for copyright protection in these jurisdictions, autonomously generated works pose a problem until they are correlated with a legal person. Correspondingly, it is necessary to develop rules to conform with the development of AI to foster innovation in the sector<sup>37</sup>. As seen in the cases of Painting Fool<sup>38</sup> and Paul,<sup>39</sup> it may be argued that an AI can put its creativity into its output via ‘randomness’, which can be seen as a personal touch that goes beyond human knowledge. However, the lack of legal personality involved prevents AI from being treated the same way as a human under the legislation. Despite it being difficult to distinguish intervention in complex AI systems, the possibility of granting copyright to works is directly proportional to the degree of human intervention. Thus, assessing the authorship problem may reveal whose ‘personal touch’ has constructed the work<sup>40</sup>.

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<sup>32</sup> *Infopaq* (n 25).

<sup>33</sup> Directive, Protection of copyright and certain related rights.” Directive 2006/116/EC of the European Parliament and of the Council.” Recital.

<sup>34</sup> *Burrow-Giles* (n 6) 94.

<sup>35</sup> *Football Dataco Ltd and others v. Yahoo! UK Ltd and others*, Case C-604/10, 2012, ECDR.

<sup>36</sup> *Ibid* 39.

<sup>37</sup> European Parliament Recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), 20. *European Parliament Committee on Legal Affairs*, Accessed on September 20, 2019. [https://www.europarl.europa.eu/doceo/document/A-8-2017-0005\\_EN.html](https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html)

<sup>38</sup> ‘The Painting Fool - A Computer Artist’, accessed 4 August 2020, <http://www.thepaintingfool.com/>.

<sup>39</sup> ‘Six Robots Named Paul’ (2020) Illuminate Productions 4. <<https://www.illuminateproductions.co.uk/six-robots-named-paul>> accessed 4 August 2020.

<sup>40</sup> European Commission, *Report on the Safety and Liability Implications of Artificial Intelligence, the Internet of Things and Robotics* (Brussels, 16(2020), Accessed on September 20, 2019. [https://ec.europa.eu/info/publications/commission-report-safety-and-liability-implications-ai-internet-things-and-robotics-0\\_en](https://ec.europa.eu/info/publications/commission-report-safety-and-liability-implications-ai-internet-things-and-robotics-0_en)

## B. Artificial Intelligence as Author

To determine whether an AI can be an author, it is first necessary to evaluate the underlying theories of copyright. There are two principal doctrines of copyright: the practical approach and the natural rights approach, with the latter being divided into personality and labour theory comes. The natural rights approach does not seem appropriate for use in supporting AI as an author; the personality doctrine refers explicitly to the character and requires intention and causality to be present in the author's actions. Moreover, labour theory refers to being rewarded in return for the endeavour, meaning that natural rights are not applicable to AI in the authorship question<sup>41</sup>. As for the practical approach, the main goal of copyright regimes is to encourage authors to innovate by granting them rights. If AI authors do not need to be incentivised, this would mean that giving them rights is unnecessary, and it may thus be asserted that AI is not suitable for authorship consideration. However, leaving AI works in the public domain without any protection may disincentivise the programmers and other participants in the AI sector and hence decrease AI development.<sup>42</sup> As the programmer programs an AI for the specific purpose to follow user instructions, the majority of regulations are inclined to suggest that attributing authorship to AI is not possible<sup>43</sup>. Recall, for instance, that non-human authors are not recognised by the US Copyright Office<sup>44</sup>, and that the court emphasised in *Naruto v. Slater*<sup>45</sup> the court emphasised that authorship refers to 'human' and 'natural persons'. On the other hand, although all these principles were developed based on the human context, debates regarding AI-generated works seem unsolvable by addressing human authorship questions. Furthermore, the human(s) who initiate the AI's course of action is (are) unaware of how the outcome will appear and what procedures the machine will follow. It can thus be argued that determinant touches regarding the originality requirement are made directly by the machine. Although instructions from a programmer or user give form to the output, the AI directs the essence of the output and could

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<sup>41</sup> Ana Ramalho, *The Competence of the European Union in Copyright Lawmaking: A Normative Perspective of EU Powers for Copyright Harmonization* (Springer, 2016) 3.

<sup>42</sup> Abbott (n 23) 1098.

<sup>43</sup> Berne Convention (1886), 17 U.S. Constitution, European Patent Convention, UK Patents Act.

<sup>44</sup> Compendium n (15) § 306, 313.2.

<sup>45</sup> *Naruto* (n 12) 11041.

thereby be considered the author. It has been argued that the legal personality problem in the AI context could be solved by granting it rights in the same manner as for companies<sup>46</sup>. However, companies are not analogous to AIs, as they have direct links to the humans involved and cannot learn, perform, or generate autonomously<sup>47</sup>. Attributing legal personality to machines must thus be done based on a different legal ground. The proposal of legal regulation in the European Parliament creating ‘a specific legal status for robots in the long run’ may thus affect the IP regime over time<sup>48</sup>. The reason why AI authorship is such a complex topic does not stem from the structure of AI specifically, but rather from the lack of descriptions in the judicial precedent and legislation on authorship and originality more generally. Arriving at the required degree of specificity to allocate authorship for human-generated output in the EU and the US and computer-generated products in the UK necessitates determining who has made the dominant contribution to the output. Therefore, it is not possible to attribute authorship to non-human entities in any of these jurisdictions.

### C. Human Authorship

#### 1. Programmers

Due to the difficulty of writing innovative algorithms, it may be fair to assess authorship in favour of programmers. Designers who write creative algorithms should be treated better than those who write ordinary algorithms. This argument contends that the machine itself and the end-user are only capable of working within limits specified by the designer; thus, the outcome represents the ‘intellectual conception’ of the designer<sup>49</sup>. Using the definition of ‘authors of the authors’, Bridy suggests that the person who creates a creative computer program should be deemed the author of its computer-generated outputs<sup>50</sup>. However, with the Feist decision, the importance of the

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<sup>46</sup> Jacob Turner. ‘Legal personality for AI.’ *Robot Rules*. Palgrave Macmillan, Cham, (2019) 173,188.

<sup>47</sup> Emily Dorotheou, ‘Reap the Benefits and Avoid the Legal Uncertainty: Who Owns the Creations of Artificial Intelligence’, *Computer and Telecommunications Law Review* 21, no. 4 (2015): 85,91.

<sup>48</sup> European Parliament Recommendations (n 40).

<sup>49</sup> Samantha Fink Hedrick, ‘I Think, Therefore I Create: Claiming Copyright in the Outputs of Algorithms’, *NYU J. Intell. Prop. & Ent. L.* 8 (2018): 324,346.

<sup>50</sup> Annemarie Bridy, ‘The Evolution of Authorship: Work Made by Code’, *Colum. JL & Arts* 39 (2015): 395,401.

creative labour itself was displaced by ‘creativity’<sup>51</sup>. Attributing authorship to the designer may expand the scope of copyright protection by focusing on the work rather than the author. It has been claimed that raising the copyright regime would be similar to giving copyright protections to a camera manufacturer even though a user has taken the actual photograph<sup>52</sup>. According to Samuelson, a designer originates the opportunity for the outcome but does not create the actual creation<sup>53</sup>. In the context of autonomous machines, it could be argued that the machines’ input, and thus the outcomes, are far more varied than the programmer could have envisaged. This problem can only be solved by determining the ‘personal touch’ originator on the AI-generated output. Some scholars argue that the one who puts forward his ‘own intellectual creation’ and gives the final shape to the resulting work is the user, while the designer’s only role is to generate the framework; therefore, the designer’s copyright ends with the underlying code<sup>54</sup>. By contrast, it is also asserted that a user’s contribution may lack conscious creative force and be akin to simply pushing a button<sup>55</sup> in such situations, the originality requirement is not fulfilled, particularly when compared to the programmer’s situation. This two-edged problem was reviewed in *the Nova Productions Ltd* case<sup>56</sup>, which ruled that the user’s contribution to the game display was not deemed as ability, effort or controlling the process. Despite having less awareness compared to the user about the final shape of the end product, the programmer’s sole endeavour is to create an AI method capable of generating freestanding works, engendering the programmer’s status as an author. It is further held that, in cases where it is impossible to foresee and predict the output, the output can still be copyrightable<sup>57</sup>; however, these cases are only valid when the user’s contribution is sufficiently simple. Contrary to this, nobody can claim that the designer of (for example) a word processing program is the author of any article written using this program. Although it may be possible to detect the relative contribution of the parties involved, this

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<sup>51</sup> *Feist* (n 8).

<sup>52</sup> Hedrick (n 47) 329.

<sup>53</sup> Pamela Samuelson, ‘Allocating Ownership Rights in Computer-Generated Works’, *University of Pittsburgh Law Review* 47 (1986 1985): 1185, 1205. <https://heinonline.org/HOL/Page?handle=hein.journals/upitt47&id=1203&div=&collection=>.

<sup>54</sup> Hedrick (n 47) 345.

<sup>55</sup> Dorotheou (n 45) 90.

<sup>56</sup> *Nova Productions v Mazooma Games* [2007] EWCA Civ. 219; [2007] Bus. L.R. 1032.

<sup>57</sup> *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99, 105 (2d Cir. 1951).

issue is becoming more complex by the day. Even though the proposal to deem programmer's authors corresponds with the UK regulation regarding 'who made the necessary arrangement', it is also incompatible with the US and EU meaning of originality (reflecting the creator's personality in the end product). On the other hand, not granting Copyright to programmers may disincentivise AI development, and programmers may also feel compelled to restrict how users can use programs<sup>58</sup>. Conversely, it is argued that a designer could conceivably gain profit from both the computer program itself and from the computer-generated works; this would imply that deeming the AI's creator to be the author would enable the programmer to 'double-dip' to an extent greater than he or she deserves.

## 2. Users

In a report by CONTU, it is stated that the authorship of work created by a computer should be attributed to the user<sup>59</sup>. Considering that the user usually pays the programmer to buy (or secure a licence to use) the program and that the designer receives his reward related to this transfer of usage, it may be more equitable to give rights to the person who uses the program to bring about further advancement<sup>60</sup>. However, it may be counterproductive for AI advancement to attribute authorship to users, as AI designers may limit users' usage rights and provide them with more limited facilities to produce work under these circumstances; as a result, the progress of both AI and the outcomes it produces could be diminished. However, in addition to stimulating the generation of works, one of the main goals of a copyright regime is to enable these works to be disseminated among the public<sup>61</sup>. Giving authorship rights to users produces the expectation that they will procure and run the program to generate new products. Users thus play a crucial role in the wealth of market output, as well as advertising the work of the programmer; thus, deeming them to be authors is compatible with the incentive theory. To define human authorship, it is essential to determine whose intellectual creation is predominant in the AI-generated work. The designer decides where

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<sup>58</sup> Kalin Hristov, 'Artificial Intelligence and the Copyright Dilemma', *IDEA: The Journal of the Franklin Pierce Center for Intellectual Property* 57, no. 3 (2017 2016): 431,444. <https://heinonline.org/HOL/Page?handle=hein.journals/idea57&id=449&div=&collection=>

<sup>59</sup> CONTU (n 18).

<sup>60</sup> Samuelson (n 51).

<sup>61</sup> *Eldred v. Ashcroft*, 537 U.S. 186, 244 (2003).

and why to use AI, but final touches are put in place by the user. In terms of intellectual contribution, moreover, computer programs can be used in such ways that users' contributions go beyond what the designer initially envisaged<sup>62</sup>. Users can give the output characteristic features by taking advantage of usable open-source code written by the programmer, and thereby may be deemed the authorised person according to CDPA 9(3)<sup>63</sup>. In the *Walt Disney* case<sup>64</sup>, the claimant designed a program called Mova, which enables forms of human faces to be instantaneously captured and made available as data. It was claimed by the programmer that, by using the program, filmmakers had replaced an actor's face with another real or imaginary face in many films, and that because the designer created the program, they also had rights to the output. It did not seem reasonable to the court that the Mova program could produce such an output unless there was a significant user effect<sup>65</sup>. The role the user plays in Mova does however differ from that in *Torah Soft*<sup>66</sup>: the data put into the program to receive an outcome is a diversified video shoot targeting human faces in the former, and only a word in the latter. Due to a lack of proof that the data input by the user was insignificant, or that the computer program did 'the lion's share of the work', it was decided by the court that the copyright could not expand to the output<sup>67</sup>. On the other hand, as CJEU pointed out when the direct link between the computer program and its output continues (such that the user cannot alter it via his contribution), this means there is no creativity added by the user.

### 3. Joint Authorship

In the process of creating output, using created algorithms is a key aspect as regards the algorithm itself. An interesting compromise could be to establish joint authorship, which may bring the designer and user together to solve the authorship problem<sup>68</sup>. In the Article 2(2) of EU Software Directive, Article 4(3) of EU Database Directive, Article 1(2) of the EU Term Directive and Article 7 of the Berne Convention which all mentioned the term 'joint

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<sup>62</sup> Samuelson (n 51) 1200.

<sup>63</sup> Guadamuz (n 29) 177.

<sup>64</sup> *Rearden, LLC v. Walt Disney*, 293 F. Supp. 3d 963 (N.D. Cal. 2018).

<sup>65</sup> *Ibid* 971.

<sup>66</sup> *Torah Soft v. Drosnin*, 136 F. Supp. 2d 276, 292 (S.D.N.Y. 2001).

<sup>67</sup> *Rearden* (n 62).

<sup>68</sup> *Aalmuhammed* (n 11).

works' is not defined explicitly. Joint authorship is only possible in the following situations: if co-partners have the shared intention to be co-author, or if the work done by each partner could independently receive copyright protection<sup>69</sup>. The challenges relating to the attribution of ownership and authorship for computer-generated products may lead judges to decide on joint authorship, as occurred in the UK Court of Appeals case of *Martin v Kogan*<sup>70</sup>. Nevertheless, joint authorship does not seem appropriate, as the conditions of necessity are not met in the context of AI-generated works. First, although the designer's contribution to the algorithm development process is copyrightable, this will mostly not be the case for user input; even if the code the programmer used to develop the AI is copyrightable, the contribution of the user to that development is not. Second, the intention requirement in both UK and US law will most likely not be met. Generally, these two parties are unaware of each other. When a user buys the computer program and begins to improve it, the programmer a) has already lost his connection to the process and b) has already been compensated. Moreover, distinguishing between the parties' relative contributions might be difficult when considered in parallel with advancements in AI. Thus, the joint authorship regime is insufficiently effective to be considered a solution.

#### 4. Public Domain

In the light of arguments that programmers create the *possibility* rather than the *actuality* of AI-generated works, and that the AI acts independently beyond the contribution of the user, it could be said that human authors are not eligible for authorship in the AI context. The US and EU laws state that a lack of human authors implies a lack of originality and thus impedes the copyright protection of the resulting work<sup>71</sup>. When it is assumed that the machine-created end product is neither AI-authored (due to restrictions in the law) nor human-authored (due to a lack of human intellectual creation), one conclusion is that no authorship privilege applies; the argument that AI-generated works belong to the public is, therefore, defensible<sup>72</sup>. Expanding the

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<sup>69</sup> CDPA s (10); 17 U.S.C. § 101 (2018).

<sup>70</sup> *Kogan v Martin* [2019] EWCA Civ 1645; [2020] E.M.L.R. 4.

<sup>71</sup> Séverine Dusollier, 'Scoping Study on Copyright and Related Rights and the Public Domain', (*World Intellectual Property Organisation Publication*, 2016) 24.

<sup>72</sup> Daniel J Gervais, 'The Machine As Author', *Iowa Law Review* 105 (2019): 2053.

public use of works is the main target of copyright law. Nevertheless, the public option may subvert the prevailing copyright approach in the US, i.e., the utilitarian approach, which defends inducing and protecting works as significant because incentivising authors to innovate further also benefits the public<sup>73</sup>. Without the protection time enabled by the copyright regime, there would be no incentive for creators to develop AI and related businesses. As long as copyright is not allocated to owners, there will be a decrease in the number of innovative developments in AI-based products, and thus a commensurate decrease in the number of works in public use over the long term.

## D. Ownership

### 1. Derivative Works

The derivative works approach may be one way to allocate copyright ownership. Derivative works comprise works that already exist, those reproduced, re-formed, and transfigured from prior ones<sup>74</sup>. According to art. 2/3 of the Berne Convention ‘translations, adaptations, arrangements of music and other alterations of a literary or artistic work shall be protected as original works without prejudice to the copyright in the original work’. By contrast, UK courts have stated that derivative works are copyrightable even where they violate the copyright of original works<sup>75</sup>. As CONTU noted, it is not possible to make a similar assessment in the context of computer-generated products, as the output of the latter does not include code from the former<sup>76</sup>. Bridy further argues that to deem computer-generated works as derivative works, the scope of the definition would need to be broadened to cover works not originating from the existing works<sup>77</sup>. However, such an expansion could be both useless in practice and destructive to existing rules. Removing the requirement of originating from a root over the definition may cause difficulties in limitation, increases in infringement action, and decreases in creativity. Moreover, the owner of the original code does not immediately

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<sup>73</sup> Christopher Jon Sprigman, ‘Copyright and Creative Incentives: What We Know (and Don’t)’, *Hous. L. Rev.* 55 (2017): 451.

<sup>74</sup> 7 U.S.C. § 101 (2011).

<sup>75</sup> *Redwood Music Ltd. v. Chappell & Co. Ltd.*, [Q.B. 1982] R.P.C. 109, 120.

<sup>76</sup> CONTU (n 18) 45.

<sup>77</sup> Bridy (n 17) 25.



become the owner of any reproduced code, as the provision pertains to the reproduced code's author; thus, the ownership complication cannot be solved by accepting the derivative work argument. Some may argue that the algorithm coded by the programmer is a source of the AI-generated output, such that, without the essential code, the derived output would not exist. However, when considering the autonomous feature of the AI machine, the link between programmer and output would be lost. It is therefore not possible to allocate authorship to the programmer via derivation. Use of the derivative work principle would make machine authorship the only possible conclusion, which does not make sense due to the machine's lack of legal personality.

## 2. Work Made for Hire

The 'work made for hire' doctrine dictates that the employer is deemed the author even though the employee did the actual work<sup>78</sup>. According to the US Copyright Office, such an employed could be a legal person or company<sup>79</sup>. This doctrine presents a new framework that expands the comprehensiveness of copyrightability. Unlike the derivative work approach, Bridy argues that this approach prevents the allocation of rights to machines by presenting a method for attributing ownership to a legal entity that did not create the work, which is more sensible in the context of AI authorship<sup>80</sup>. As a similar approach, the UK is an example of a jurisdiction that accepts non-human authorship regarding copyright protection to protect AI-generated works<sup>81</sup>. In terms of computer-generated work, 'work made for hire' would propose that the programmer rather than end-user be considered the author<sup>82</sup>. This doctrine may therefore prevent legal and practical issues such as public domain risks that may arise from AI authorship. Furthermore, although Bracha argued that 'work made for hire' contravenes the Berne Convention's fundamental ground of romantic authorship, which targets an author who performs the inspirational action, 'work made for hire' targets only the action itself.<sup>83</sup> This type of

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<sup>78</sup> 17 U.S. Code § 201(b).

<sup>79</sup> US Copyright Office. "Circular 9: Works Made for Hire." (2012). Accessed on September 21, 2019. <https://www.copyright.gov/circs/circ09.pdf>

<sup>80</sup> Bridy (n 17) 22.

<sup>81</sup> CDPA s (178).

<sup>82</sup> Victor M Palace, 'What If Artificial Intelligence Wrote This: Artificial Intelligence and Copyright Law', *Fla. L. Rev.* 71 (2019): 217,235.

<sup>83</sup> Oren Bracha, 'The Ideology of Authorship Revisited: Authors, Markets, and Liberal Values in Early American Copyright', *Yale LJ* 118 (2008): 186,260.

attitude may encourage companies to continue developing AI technology and make them comfortable about bearing the costs. However, while this doctrine proposes some solutions for current problems, it also poses some new problems. First, ‘work made for hire’ may be impossible to apply to AI-generated products under US law. The Supreme Court has laid down criteria in common law that govern the definition of an employee: these consist of the tax responsibility of the hired party; specifications regarding the scope of work area and workload, forms of payment and insurance details<sup>84</sup>. These requirements make it impossible for an AI to be deemed an employee, as an AI has no legal rights to speak for itself or establish a business relationship. In addition, as it attributes ownership to the programmer, this doctrine is also affected by the issues associated with programmer authorship. Moreover, as in the case of user ownership, allocating ownership to the AI itself may preclude designers from obtaining rewards and thus deter investment in the AI sector. To extend the information mentioned above, the patent protection regulated under the different jurisdictions’ patent laws -the US, the UK, and the EU- is reviewed to examine the human inventors' ownership and decide whether the invention is patentable or worth patenting.

### III. PATENT

#### A. In General: Patent Protection of Artificial Intelligence Inventions

From most perspectives, AI threatens the fundamentals of the patent system in a very complex way. Since it is likely to be increasingly relevant soon, the necessity of comprehensively recognising AI activities under a legal framework is also increasing. The patentability of AI-generated inventions must be evaluated with respect to the patent regime’s mission and motivation. The approaches related to the patentability of AI differ across the globe. To decide whether an invention generated by an AI-run algorithm should be patentable, one should first assess whether the software is patentable; if the software is not deemed to fall within the excluded field in particular cases, the decision regarding the AI-generated invention will be similar<sup>85</sup>.

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<sup>84</sup> Yvette Joy Liebesman, ‘The Wisdom of Legislating for Anticipated Technological Advancements’, *J. Marshall Rev. Intell. Prop. L.* 10 (2010): 153,175.

<sup>85</sup> Erica Fraser, ‘Computers as Inventors – Legal and Policy Implications of Artificial Intelligence on Patent Law’, *SCRIPTed* 13, no. 3 (16 December 2016): 305,322, <https://doi.org/10.2966/scrip.130316.305>.

## 1. Patentability and Authorship under the United States Patent Law

The patentable subject matter has been limited by aspects of the U.S. Codes such as ‘new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof’<sup>86</sup>. There is no exclusion field regarding the patentable subject matter: unlike EU and UK law, ‘anything under the sun that is made by man is patentable’ in US law. In practice, the Supreme Court decided that ‘the laws of nature, physical phenomena, and abstract ideas’ are not patentable<sup>87</sup>. The most faced problem when granting patents to software is them being perceived as abstract ideas<sup>88</sup>. In 2014, despite the growing number of patent applications, the implementation of the patent regime became more problematic for AI following the Alice decision<sup>89</sup>. In the case in question, the computational algorithms (which decreased the risk of interchange for financial operations between parties) were offered the chance to participate as agents to smoothen the interactions between parties. The Supreme Court noted that financial operations did not count as improving the technical effects of a particular area; it was thus an abstract idea, which is excluded from patentable subject matter, and the ordinary operation of computers does not make unpatentable subject matter patentable<sup>90</sup>. The Supreme Court’s decision regarding whether AI-generated works are patentable was based on the following two conditions: first, is the work directed towards patentable subject matter, or is it an abstract idea? Second, are these features of the work sufficient, in terms of the inventive step, to convert the subject matter from not patentable to patentable<sup>91</sup>? It seems that the ‘abstract idea’ concept was broadened with this decision and increased the vagueness regarding how software-implemented inventions could fall under patentable subject matter. It is possible to identify the key points of the assessment in the subsequent decisions. The meaning of ‘abstract idea’ was explained by Judge Hughes in the English Court as follows: if the invention poses a solution to a particular problem, rather than being general, it can be deemed to fall under patentable subject matter<sup>92</sup>. Moreover,

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<sup>86</sup> 35 U.S. Constitution § 101: Statutory Requirements and Four Categories of Invention, (2006)

<sup>87</sup> *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980).

<sup>88</sup> *Bilski v. Kappos* 561 U.S. 593 (2010) 13.

<sup>89</sup> *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2349 (2014).

<sup>90</sup> *Ibid.*

<sup>91</sup> *Ibid.*, 2357.

<sup>92</sup> *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327,1330 (Fed. Cir. 2106).

in the *Bandai Namco Games* case, it was held that an algorithm that generated profiles among intended expressions on 3D-animated faces was not abstract, because it improved functionality and was thus patentable<sup>93</sup>. Moreover, in the *Bascom* case, it was clarified that if the invention was made of prior works in the area in question, it is abstract<sup>94</sup>. Thus, *Bascom* fell short, while *Bandai* and *Enfish* passed the first Alice step test. The second step concerned whether the invention was sufficiently inventive to convert the subject matter from unpatentable to patentable<sup>95</sup>. Even if the components of the program were recognisable as being part of existing works, conventional components used in an unconventional way may clear the inventive step. Similarly, in the *Bascom* case, although the subject matter was held to be patent ineligible, the court decided that the method used to filter the content passed the second step<sup>96</sup>. No matter how patentable the subject matter is decided to be, it is also important to assess whether it stimulates innovation. While there are arguments to assert that patenting AI outcomes would increase innovation and investment, some scholars have argued that the scope of patentability must be restricted to prevent the stifling of inadequate ordinary innovation. When UK, EU and USA laws are compared, it could be concluded that software can obtain a patent regarding the work as considered in total, as well as its distinguished worthiness and technical features.

## 2. Patentability and Authorship under the United Kingdom Patent Law

To obtain patent protection, according to the UK Patent Act, inventions must be inventive, novel and industrially applicable<sup>97</sup>. In addition to this, UK Patent Act 1(2) has rendered a list of inventions excluded from patentability: these include mathematical methods, computer programs and methods related to mental acts<sup>98</sup>. It could be assumed that software falls under this category. However, the exact declaration made in the list is that inventions at a degree ‘as such’ are not patentable; the meaning of ‘as such’ is also not clearly

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<sup>93</sup> *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1314 (Fed. Cir. 2016)

<sup>94</sup> *Bascom Glob. Internet Servs. v. AT&T Mobility LLC*, 827 F.3d 1341, 1349 (Fed. Cir.2016).

<sup>95</sup> *Alice* (n 112) 2350.

<sup>96</sup> *Bascom* (n 117).

<sup>97</sup> The Patents Act 1977. Intellectual Property Office, s. 1, Accessed on September 21, 2019. <https://www.gov.uk/government/publications/the-patents-act-1977>

<sup>98</sup> *Ibid* s 1(2).

defined in the legislation. Prior to the *Aerotel* decision<sup>99</sup>, when defining technical character, the ‘any hardware approach’ of EPO has been pursued by UK courts. Subsequently, Jacob LJ conjured up a technical assessment test in *Aerotel* to specify whether an invention is patentable<sup>100</sup>. Regarding this test, if the invention makes a technical contribution in total, and if this does not just fall under the excluded subject matter, it may be patentable. Determining the difference between the two inventions put forward in the *Aerotel* case is helpful for clarifying the implementation. It was decided that the ‘special’ telephone exchange – a unique system for making calls with credit codes and phone numbers – surpassed the limits of algorithms and business methods and was thus esteemed in a patentable context; by contrast, the ‘automated’ computer program, which generated documents for incorporation in a way that did not require consulting lawyers was esteemed as a business method ‘as such’ and thus not deemed patentable subject matter<sup>101</sup>. In short, the first case was not in the excluded field, while the latter was. Although, at first, it was held that any technical contribution that provides a solution to a technical problem cannot be excluded from patentable subject matter<sup>102</sup>, the means of assessing ‘technical contribution’ changed over time<sup>103</sup>. The UK courts found that technical AI implementations of technical problems are patentable, especially if the AI can penetrate operations beyond the computer by using the computer as a means, with a focus on mission differing from the excluded subject matter<sup>104</sup>. The current approach is that mere technical contribution is insufficient: the patentable subject matter must be out of the excluded field. As another requirement, to pass the inventive step, the invention must be non-obvious to PHOSITA<sup>105</sup>. If it is assumed that mathematical methods or software codes producing computer programs or new methods have similar data features, the outputs will not be deemed inventive. However, it could be considered that if the derived codes were able to enforce different technical contributions to the technical problem compared to the ancestor codes, this

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<sup>99</sup> *Aerotel v Telco Holdings; Re Macrossan’s Application* [2006] EWCA Civ 1371.

<sup>100</sup> *Aerotel v Telco Holdings* [2007] 1 ALL ER 225, [27 -29]

<sup>101</sup> Ibid.

<sup>102</sup> *Symbian v Comptroller General of Patents, Designs and Trade Marks* [2008] EWHC 518 (Pat).

<sup>103</sup> *AT&T Knowledge Ventures; Re CVON Innovations* [2009] EWHC 343 (Pat).

<sup>104</sup> *HTC v Apple* [2013] EWCA Civ 451.

<sup>105</sup> The Patents Act 1977. Intellectual Property Office, s. 3. Accessed on September 22, 2019. <https://www.gov.uk/government/publications/the-patents-act-1977>

would be deemed inventive. If the AI has the randomness feature, the inventions produced will be new<sup>106</sup>. When the computational force of AI is considered, it is necessary to reinterpret the type of assessment applied to the inventive step. When the effective contribution of AI is considered, the inventiveness standard for inventors is significantly increased, as can be seen from the debates over evaluating the technical character of the methods pertaining to the patentable subject matter. Nevertheless, along with this increase, it is essential to raise the level of PHOSITA, as well to balance the quality of patents and stimulate inventiveness. Although this may pose difficulties in the context of sole human inventors, every possible means can be used to fulfil the aim of ‘inventive step’<sup>107</sup>.

### 3. Patentability and Authorship under the European Union Patent Regulations

The fundamental patentability requirements in EPC are newness, inventiveness, and industrial applicability, while excluded fields are scientific theories, discoveries, mathematical methods, and computer programs<sup>108</sup>. It could therefore be assumed that software falls into the latter category. However, the third paragraph of Art.52 points out that ‘computer programs as such’ are not patentable, although the meaning of ‘as such’ is not clearly defined in the legislation<sup>109</sup>. The EPO interpreted ‘as such’ to refer to abstract inventions and thus ruled that computer programs with a technical character are not excluded<sup>110</sup>. Nevertheless, the approach of EU law to AI-based inventions has evolved over time. At first, the Board of Appeal applied the technical contribution standard to assess whether AI is patentable<sup>111</sup>. This does not focus on the essence of the invention, but rather on what the invention does. It has been asserted by the Boards of Appeal that if the work can be

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<sup>106</sup> Liza Vertinsky, ‘Thinking Machines and Patent Law’, in *Research Handbook on the Law of Artificial Intelligence*, ed. Woodrow Barfield and Ugo Pagallo (Cheltenham, UK: Edward Elgar Publishing, 2018), 489,494.

<sup>107</sup> Robert Plotkin, *The Genie in the Machine: How Computer-Automated Inventing Is Revolutionizing Law and Business* (Stanford University Press, 2009) 110.

<sup>108</sup> EPC, Art.52(1)

<sup>109</sup> Ibid (3).

<sup>110</sup> IBM/Computer Programs, T1173/97 [2000] EPOR 219, 226.

<sup>111</sup> European Patent Office Board of Appeals, *Computer-related invention T 0208/84*, 1986. Accessed on September 22, 2019. Accessed on September 22, 2019. <https://www.epo.org/law-practice/case-law-appeals/recent/t840208ep1.html>

deemed technical in total while involving both non-technical and technical functions, it could be evaluated as patentable<sup>112</sup>. The underlying rationale of this approach is an attempt to protect every useful invention that becomes physically usable so that in terms of the claim, there is no difference between the method enabling a machine to operate and the machine itself<sup>113</sup>. However, this approach has been criticised at length because there is no reference provided for assessing the differences between the invention and prior works, while the lines between inventiveness, newness and subject matter eligibility have also become blurred. On the other hand, in the Pension benefits case<sup>114</sup>, the EPO transformed its attitude from the contribution approach to any hardware approach, aiming to classify the subject matter rather than its contribution to prior works. Any hardware approach defines technicality as involving technical means, regardless of the evaluation of ‘inventive step’ or ‘novelty’. If the subject matter is included in or includes technical means, it will not be assumed to fall within an excluded field, even if it is used in these fields. Moreover, it was also stated in another case that it is not important whether the program in question is standalone code or contained within a physical device<sup>115</sup>. In *the Pension* case, due to the impossibility of the carrier falling under the category of excluded subject matter, a method that runs in a carrier (even if it operates in the business field) was deemed to be an invention, as it has physical effects and therefore a technical character<sup>116</sup>. Any hardware approach can be criticised for broadening the scope of the subject matter, which raises the possibility that a particular technical characteristic related to invention will go unnoticed, making Art.52 useless<sup>117</sup>. Notably, the claim in *the Microsoft* case<sup>118</sup> concerned a computer program written in a machine-readable medium (regarding the way in which words were transferred among formats). Due to the alteration in approach, it was decided that in contrast to

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<sup>112</sup> European Patent Office, *Guidelines for Search and Examination at the EPO as PCT Authority GL/PCT-EPO C-IV, 2.2*, (2011), Accessed on September 22, 2019. [https://www.epo.org/law-practice/legal-texts/html/guidelinespct/e/c\\_iv\\_2\\_2.htm](https://www.epo.org/law-practice/legal-texts/html/guidelinespct/e/c_iv_2_2.htm)

<sup>113</sup> Ibid 5.3.

<sup>114</sup> *Pension Benefit Systems Partnership*, T931/95 [2001] OJEP0 441, 449. (TBA).

<sup>115</sup> European Patent Office, *Programs for Computers G03/08*, Para 10.7.2 (2010), Accessed on September 22, 2019. <https://www.epo.org/law-practice/case-law-appeals/recent/g080003ex1.html>

<sup>116</sup> *Pension* (n 90).

<sup>117</sup> Justine Pila, ‘Dispute over the Meaning of “Invention” in Article 52 (2) EPC—The Patentability of Computer-Implemented Inventions in Europe’, *IIC* 36 (2005): 173,175.

<sup>118</sup> *Microsoft/Clipboard Formats I T0424/03* (23 Feb 2006), para 5.1.

the IBM case, owing to the allocated technical feature involving a machine-readable medium, improving the features of this medium via computer program constituted a further technical effect. As explained by MS Brimelow, the different paths of claims may be assessed differently: claiming only as a computer program will not pass the assessment, while a computer-executed algorithm might qualify<sup>119</sup>. Defining a field of inventions as excluded from patentability may potentially pose problems as technology develops. This has occurred in the case of computer programs due to the evolution of AI. Attempting to categorise and determine whether a specific innovation is technical in the context of software and autonomous machines is problematic, as was highlighted by the British Comptroller of Patents<sup>120</sup>. The EPO implements a problem-solving method to assess the inventive step according to 42(1)(c) of EPC. Although normally distinct from each other, the EPO correlates subject matter eligibility with the inventive step; this is due to the technical requirement of the ‘invention’ and the need to assess the prior works related to it. To be inventive, an invention should not be obviously related to prior works for the person having ordinary skills in the art (PHOSITA) and should also solve the technical problem in the prior work. When assessing prior work, the EPO further stated that such assessment should be focused on the area of the problem, rather than the solution, if these two differ<sup>121</sup>. Economic and time-saving contributions are not assessed in terms of the solution. In practice, the patentability averages of an invention under both the UKIPO (UK Intellectual Property Office) and EPO are similar; this is because, while EPO might deny a specific claim related to a solution for a technical problem in connection with non-obviousness, UK courts might deny the same based on subject matter eligibility.

#### 4. Artificial Intelligence as a Phosita

In all assessed jurisdictions, AI-invented products are patent-eligible in terms of subject matter. In addition, the invention must be new to a ‘person skilled in the prior art’ to obtain patent protection. For now, to some extent,

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<sup>119</sup> European Patent Office Board of Appeals, *Referral by the President of the EPO, G 3/08, OJ EPO 142*, 2009, Accessed on September 22, 2019. <https://www.epo.org/law-practice/case-law-appeals/recent/g080003eu1.html>

<sup>120</sup> Fujitsu’s Application [1996] RPC 511, 521

<sup>121</sup> *Ibid.*



humans can understand the working type of AI, while some of its inventions surpass the inventive step requirements (even for PHOSITAs)<sup>122</sup>. However, it is ambiguous how human PHOSITA will be enforced as AI becomes more inventive and complex. In order to keep up with the development of AI, some requirements may have to change, possibly even including the human PHOSITA himself<sup>123</sup>. Considering this, it was held in *the Graham* case that obviousness should be adaptable and assessed according to the conditions of the situation<sup>124</sup>. It may be argued that an AI PHOSITA will be an appropriate approach in future, as it will dissolve the discussions related to analogous areas for use in defining the scope of the existing art simply by having knowledge in all areas. It could further be said that the increasing effectiveness of AI in the inventing process should lead US the patent system to consider AI PHOSITAs, as the Supreme Court has held that the inventive step should be determined by considering the level of technological advancement<sup>125</sup>. However, in the case of updating the PHOSITA to the level of AI, the inventiveness threshold would certainly increase, along with an enlargement of the scope of prior art. Therefore, humans unable to use AI will fall behind in achieving non-obviousness<sup>126</sup>.

## B. Inventorship

Output autonomously generated by ‘creativity machine’ was patented on behalf of Abbott. Abbott highlighted that due to the risk of encountering the hazard of patent forfeit because of uncertainty in the legal system, applicants are beginning to conceal the identity of the actual inventor<sup>127</sup>. Contemporary judicial systems require a legal person to be an inventor; however, given the appearance of fully autonomous AI machines, the difficulty of distinguishing between human and AI contributions will increase in parallel with the

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<sup>122</sup> Ben Hattenbach and Joshua Glucoft, ‘Patents in an Era of Infinite Monkeys and Artificial Intelligence’, *Stan. Tech. L. Rev.* 19 (2015): 32,45.

<sup>123</sup> Daryl Lim, ‘AI & IP: Innovation & Creativity in an Age of Accelerated Change’, *Akron Law Review* 52 (2018): 813,861. <https://heinonline.org/HOL/Page?handle=hein.journals/aklr52&id=837&div=&collection=>.

<sup>124</sup> *Graham v. John Deere Co.*, 383 U.S. 1 (1966).

<sup>125</sup> *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

<sup>126</sup> Brenda M Simon, ‘The Implications of Technological Advancement for Obviousness’, *Michigan Telecommunications and Technology Law Review* 19 (2013): 331,350.

<sup>127</sup> Abbott (n 23) 1097.

contribution made to the inventive step by artificial intelligence<sup>128</sup>. It is thus critical to determine who will be designated the inventor of autonomously generated works. Patent infringement issues could potentially arise if the inventorship of AI-generated inventions is incorrectly ascribed. There are three possible options that might result: a computer being considered a legal person, a human who is not the author being assigned authorship, or a public domain option.

### 1. Artificial Intelligence Inventorship

Every legal person can be considered an inventor under Art 58 of EPC<sup>129</sup>. In addition, under EPC, the forms and instructions applicants must fill out and follow during the patenting process all imply that the inventor is envisaged as a human being<sup>130</sup>. Nevertheless, it is possible to bring an application procedure to the last step without identifying the inventor. Accordingly, some have argued that these guidelines leave the door open to AI inventorship<sup>131</sup>. On the other hand, in the UK, the inventor is required to be a person, and an AI cannot be deemed as a person under the law<sup>132</sup>. The term ‘actual designer’ in Section 7 (3) has been interpreted by UK courts as a requirement of inventive conception being derived from a natural person<sup>133</sup>. Similarly, the US Supreme Court remarked that ‘anything under the sun that is made by man’ is patentable, which clearly indicates that an inventor must be human; neither machines nor companies can be deemed inventors under the US patent system<sup>134</sup>. The Federal Circuit further stated, by referring to the ‘formation in the mind’ requirement of invention under USPA, that an inventor could only

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<sup>128</sup> Ibid 1089.

<sup>129</sup> “European Patent Convention” opened for signature October, 4 1950 European Patent Organization, Art. 58, Accessed on September 23, 2019. <https://www.epo.org/law-practice/legal-texts/epc.html>

<sup>130</sup> Ibid Art.19(1), Art 41(2)(j).

<sup>131</sup> Abbott (n 23).

<sup>132</sup> Intellectual Property Office, ‘*Formalities Manual Chapter 3.05: The Inventor*’, (28 October 2019), Accessed on September 23, 2019. <https://www.gov.uk/guidance/formalities-manual-online-version/chapter-3-the-inventor>

<sup>133</sup> University of Southampton’s Applications, Reports of Patent, Design and Trade Mark Cases, Volume 122, Issue 7, 2005, Pages 220–242, Accessed on September 23, 2019. <https://doi.org/10.1093/rpc/2005rpc11>

<sup>134</sup> Austin J. Kim and Matthew Horton, ‘USPTO Confirms Inventorship as Limited to Natural Human Beings’, LexBlog, 30 April 2020, <https://www.lexblog.com/2020/04/30/uspto-confirms-inventorship-as-limited-to-natural-human-beings/>; Diamond n (121)

be a human being<sup>135</sup>. Both the being-human and mentality requirements complicate the question of AI inventorship. Although courts in all jurisdictions discuss inventiveness as a mental act, their Patent Acts contain no such requirement<sup>136</sup>. Regarding computers, some have argued that the extension of legal personhood to companies may constitute precedent, as both lack emotions, intention, and consciousness; however, computers may act autonomously, while companies depend entirely on human action<sup>137</sup>. Abbott further argues that ‘conception’ should not be a reference point for inventorship, as the courts interpret the term to address the actual time of production<sup>138</sup>. Patent law must be interpreted broadly in line with the Congress’ approach<sup>139</sup>. In terms of the basic theories underlying the patent regime, none of the theories apart from the utilitarian one can be applied in favour of an AI due to its lack of personality and ability to own property. The main goal of utilitarian theory in the patent system is to incentivise R&D in specific areas by giving rights to inventors; however, it has been hotly contested that AI inventorship is not compatible with the underlying principles due to the lack of incentives<sup>140</sup>. By contrast, Abbott argues that recognising an AI as an inventor and patenting the works it has generated could be compatible with the existing patents system; setting aside the fact that incentivisation does not make sense for AI, this approach benefits programmers and accelerates further development<sup>141</sup>. Designers may select other IP rights if it is not possible to obtain patents for AI-generated inventions, which may cause delays in the spread of AI work through the public domain, and thus further development in the sector.

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<sup>135</sup> University of Utah v. Max-Planck-Gesellschaft Zur Forderung Der Wissenschaften EV, 734 F.3d 1315, 1323 (Fed. Cir. 2013).

<sup>136</sup> University of Southampton’s Applications, Reports of Patent, Design and Trade Mark Cases, Volume 141, Issue 7, 2005, Pages 220–242, Accessed on September 24, 2019. <https://doi.org/10.1093/rpc/2005rpc11>

<sup>137</sup> Garikai Chimuka, ‘Impact of Artificial Intelligence on Patent Law. Towards a New Analytical Framework – [ the Multi-Level Model]’, *World Patent Information* 59 (December 2019): 101926, <https://linkinghub.elsevier.com/retrieve/pii/S0172219018300814>.

<sup>138</sup> Abbott (n 23) 1108.

<sup>139</sup> *Diamond* (n 110) 317.

<sup>140</sup> Alexander J Kasner, ‘The Original Meaning of Constitutional Inventors: Resolving the Unanswered Question of the MadStad Litigation’, *Stan. L. Rev. Online* 68 (2015): 24,28.

<sup>141</sup> Ryan Abbott, *The Reasonable Robot: Artificial Intelligence and the Law*, 1st ed. (Cambridge University Press, 2020), 88. <https://www.cambridge.org/core/product/identifier/9781108631761/type/book>.

## 2. Human Inventorship

Deeming the programmer to be the inventor would be a logical way of incentivising public usage. Programmers, by retaining ownership, generally open the usage of programs to the public. When a machine produces new inventions with contributions from the user, however, a conflict between user and programmer may arise. While it could be argued that programmers are most likely to be the inventor, it is also clear that if the outcome is produced autonomously by an AI, or the last touch is applied by the user, the ultimate outcome could not have been predicted by the programmer. If the human inventor of the AI lacks the capacity to precisely predict the AI's capabilities and the outcomes it might have produced, assigning inventorship of the AI's new invention to the same person would be both meaningless and too much reward<sup>142</sup>. Nevertheless, in the event that regulations support users being assigned inventorship, programmers might restrict how their program can be used, which will cause a slowdown in AI development. Another option could involve the human or corporate entities who own the AI being deemed inventors. This option would also help to prevent legal liability concerns<sup>143</sup>. However, denying the AI inventorship by instead rewarding someone who did not contribute to the development of the mental concept related to the invention is a contradictory approach. Thus, if it is not possible to deem a natural person, a legal person, or an AI to be the inventor, this can only mean that there is no legal inventor.

## 3. Public Domain

If no human is entitled to the title of the inventor because no human has made the necessary contribution, and if an AI's inventorship cannot be approved due to its lack of legal personality, the only remaining option is to make the invention public domain. However, as stated in the copyright section, the public domain approach would highly disincentivise the programmers and developers of the AI technology and thus prevent further development<sup>144</sup>.

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<sup>142</sup> Abbott (n 23) 1095.

<sup>143</sup> Fraser (n 83) 331.

<sup>144</sup> Ibid.

### C. Ownership

Assigning ownership of AI-generated inventions to the AI itself may be a plausible option, both because the AI is the source of the labour and because it would incentivise AI innovation. Ownership is inherently attached to the inventorship unless otherwise agreed upon<sup>145</sup>. If an AI was permitted to be deemed an inventor, it could also be the owner. However, this is not possible according to the current laws of the various jurisdictions because an AI is not recognised as a legal person. If an AI cannot be an owner, then ownership may be allocated in different ways to protect the AI-generated invention and incentivise innovation. One option may be to take regulatory steps, such as allocating ownership of AI-generated inventions to legal entities or natural persons. The owner of the AI seems to be the best candidate for becoming the owner of AI-generated inventions; moreover, this proposal also solves the legal representation obstacle of AI<sup>146</sup>. The EPO announced in a draft that shifting the ownership perception from the inventor to a corporate entity system may be discussed<sup>147</sup>. However, transferring the rights emerging from AI to legal persons does not seem logical: first, because an AI does not have legal rights to transfer, and second, because making this possible would transform the copyright ‘work made for hire’ approach into a patent system, despite the two being different areas<sup>148</sup>.

### IV. THE DABUS CASE

AI inventorship was claimed in UKIPO, EPO and USPTO with the DABUS case. The applicant contended that, due to being the owner of the machine, the ownership rights should be granted to him<sup>149</sup>. In the UK, the patent officer stated that although it was clear that the AI had generated the inventions, it could not be deemed an inventor because it lacked legal personhood<sup>150</sup>. Moreover, due to said lack of legal personhood, in addition to

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<sup>145</sup> UK Patents Act of 1977, s 7(2).

<sup>146</sup> Abbott (n 23) 1114.

<sup>147</sup> European Patent Office, *Patenting Artificial Intelligence Conference Summary*, (2018) <<https://www.epo.org/news-events/events/conferences/2018/ai2018.html>> accessed 5 August 2020.

<sup>148</sup> Lim (n 121) 858.

<sup>149</sup> Act, Patents. "Patents Rules 2007, Notification of Grant: Patent Serial No." GB2511419, dated Sep 8, no. 2015 (1977): 2. Accessed on September 24, 2019. <https://www.ipo.gov.uk/p-challenge-decision-results/o74119.pdf> > accessed 5 August 2020.

<sup>150</sup> Ibid.

not being able to be an inventor, the AI also could not be accepted as a rights holder (even to immediately reassign such rights)<sup>151</sup>. The AI inventorship claim of DABUS in the EPO was rejected on the similar ground that only natural persons could be inventors in the sense stipulated by Art.19 and Art.81 of EPC under EU law<sup>152</sup>.

Regarding their regulations, both UKIPO and EPO have stated that only a named person can be an inventor. Similarly, USPTO decided that DABUS could not be deemed an inventor, due to its approach that only natural persons could provide the required ‘conception’<sup>153</sup>. Moreover, the US copyright system does not recognise AI-generated outcomes that lack human intervention, while the patent system has shed light on this approach through the Dabus decision. The claimants asserted that both UKIPO and EPO recognised that the outcome was generated by DABUS (by concluding that it cannot be an investor in the legal sense); however, in the US, which differs from the EU and UK legal context, it is not possible to nominate an AI as an inventor in a patent application. To ensure better protection for AI-generated works, the unity of approaches and the predictability of the patent process must be consolidated by legal regulations.

## V. CONCLUSION

In conclusion, although some scholars have argued that the current IP regime is sufficient to deal with AI development and autonomously generated products and that any amendment in favour of AI regarding inventorship/authorship may endanger the grounds of the IP regime, the accelerating technological developments in the field of AI creates vagueness regarding how IP protection should be enforced<sup>154</sup>. In terms of copyright protection, AI-generated works are copyrightable in all jurisdictions mentioned above through the allocation of human authorship. However, the UK approach seems to overcome the issue of the connection between AI-generated works and human authorship allocation to some degree by officially

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<sup>151</sup> Ibid.

<sup>152</sup> European Patent Office, ‘EPO Publishes Grounds for Its Decision to Refuse Two Patent Applications Naming a Machine as Inventor’, Accessed on August 6, 2019, <https://www.epo.org/news-events/news/2020/20200128.html>.

<sup>153</sup> Kim and Horton (n 146).

<sup>154</sup> Hayleigh Boshier et al., ‘WIPO Impact of Artificial Intelligence on IP Policy Response from Brunel University London, Law School & Centre for Artificial Intelligence’ (Brunel University London, 2020) 7.

accepting the existence of computer-generated works; this contrasts with the efforts of the US and EU, which will be incompatible with possible autonomous AIs in the future. Nevertheless, the authorship issue about autonomously produced works cannot seem to be solved comprehensively by AI authorship. This is due in part to the impediments of existing laws in these jurisdictions, such as the inability to assign an AI legal personhood; moreover, the problem also cannot be resolved by assigning human authorship (which would be given to either the user or programmer) because humans are behind the AI in terms of their ability to assess inventions. Even though derivative work and made-for-hire approaches have breathed some new life into the ownership approach, it is impossible to defend them within the legal structure. Furthermore, without protection, the possibility that AI-generated works will fall into the public domain suggests the need for change, as this would be contrary to the basic principles of the copyright system. In terms of patent protection, while the EU, UK and US approach to AI-generated works have changed over time, all these approaches have certain deficiencies. Furthermore, all jurisdictions' inventive step assessment approaches have become either intertwined with or more critical than the eligibility of the subject matter due to the capacity of AI-generated inventions to meet subject matter requirements. Although there are patented inventions that AI has generated, a current assessment of the inventive step in the hands of humans does not seem appropriate when considering the advancements AI is capable of; likewise, the solution is often referred to as 'AI Phosita' may adversely affect human inventors. Without a balance with patent law by addressing the current practice, the increasing number of AI-generated inventions may decrease the quality and inventiveness. This is because implementing the vital protections provided for human-made stories to AI-generated inventions would reduce rewards due to the ease of achievement. Shortening the length of patent protection or raising the level of the inventive step may be the solution. The lack of legal personhood prevents AI from being described as an inventor in the named jurisdictions and assigning its ownership rights to someone else to constitute human ownership, as seen in *the Dabus* case. However, to allocate human inventorship (whether of user or programmer) to autonomous inventions, or to allow such works to enter the public domain, would contradict the goal of the patent law system (i.e., to incentivize innovation); Therefore, investigating solutions to deal with AI development by improving current IP systems is crucial.

## **BIBLIOGRAPHY**

### **Primary Sources**

17 U.S. Constitution § 101 (2018).

17 U.S. Constitution § 201(b) (2011).

35 U.S. Constitution § 101: Statutory Requirements and Four Categories of Invention, (2006)

7 § 101 (2011).

Act, Patents. "Patents Rules 2007, Notification of Grant: Patent Serial No." GB2511419, dated Sep 8, no. 2015 (1977): 2. <https://www.ipo.gov.uk/p-challenge-decision-results/o74119.pdf> > accessed 5 August 2020.

Berne Convention (1886) Art.2 (1).

Berne Convention (1886) Art.2(3).

Berne Convention (1886) Art.7.

Directive (EC) 1996/9 on the legal protection of databases [1996] OJ L77/20 Art.4 (3).

Directive, Protection of copyright and certain related rights." Directive 2006/116/EC of the European Parliament and of the Council." Recital.

Directive 91/250/EEC of the European Parliament and of the Council of 14 May 1991 for legal protection of computer programs. Art. 1(3). Publications Office of the European Union.

Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs". Art. 2(1). Publications Office of the European Union.

EPC Art 41(2)(j).

EPC Art.19(1).v

EPC Art.42 (1)(c).

European Patent Convention opened for signature October, 4 1950 European Patent Organization, Art. 58, <https://www.epo.org/law-practice/legal-texts/epc.html>



EPC Art.52(1)

European Patent Office

*Guidelines for Search and Examination at the EPO as PCT Authority GL/PCT-EPO C-IV, 2.2*, (2011),

[https://www.epo.org/law-practice/legaltexts/html/guidelinespct/e/c\\_iv\\_2\\_2.htm](https://www.epo.org/law-practice/legaltexts/html/guidelinespct/e/c_iv_2_2.htm)

European Commission, Report on the Safety and Liability Implications of Artificial Intelligence, the Internet of Things and Robotics (Brussels, 16(2020), [https://ec.europa.eu/info/publications/commission-report-safety-and-liability-implications-ai-internet-things-and-robotics-0\\_en](https://ec.europa.eu/info/publications/commission-report-safety-and-liability-implications-ai-internet-things-and-robotics-0_en)

European Parliament Directive 2006/116/EC Art.1(2)

European Parliament Directive 2009/24/EC on the legal protection of computer programs Article 2(1).

European Parliament Recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), 20. *European Parliament Committee on Legal Affairs*, [https://www.europarl.europa.eu/doceo/document/A-8-2017-0005\\_EN.html](https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html)

European Patent Office, 'EPO Publishes Grounds for Its Decision to Refuse Two Patent Applications Naming a Machine as Inventor', accessed August 6, 2020, <https://www.epo.org/news-events/news/2020/20200128.html>.

Final Report of the National Commission on New Technological Uses of Copyrighted Works, July 31, 1978. Library of Congress, 1979.

Referral by the President of the EPO, G 3/08 [2009] OJ EPO 142.

United States Copyright Office, "Compendium of US Copyright Office Practices." (2014). <https://www.copyright.gov/comp3/>

US Copyright Office. "Circular 9: Works Made for Hire." (2012). <https://www.copyright.gov/circs/circ09.pdf>

<https://www.copyright.gov/circs/circ09.pdf> [<https://perma.cc/V86P-SA8A>].

- U.S. Office of Technology Assessment (OTA), Intellectual Property Rights in an Age of Electronics and Information, (1986) 73. <https://ota.fas.org/>
- The Patents Act 1977. Intellectual Property Office, s. 3. <https://www.gov.uk/government/publications/the-patents-act-1977>
- The Patents Act 1977. Intellectual Property Office, s. s 7(2). <https://www.gov.uk/government/publications/the-patents-act-1977>
- U.S. Constitution, Art. 1, sec. 8, cl. 8.
- The Agreement on Trade-Related Aspects of Intellectual Property Rights”, opened for signature April 15,1994. World Trade Organization. [https://www.wto.org/english/tratop\\_e/trips\\_e/trips\\_e.htm](https://www.wto.org/english/tratop_e/trips_e/trips_e.htm)
- Aalmuhammed v. Lee, 202 F.3d 1227, 1234 (9th Cir. 2000).
- Aerotel v Telco Holdings [2007] 1 ALL ER 225, [27 -29]
- Aerotel v Telco Holdings; Re Macrossan's Application [2006] EWCA Civ 1371.
- Alfred Bell & Co. v. Catalda Fine Arts, Inc., 191 F.2d 99, 105 (2d Cir. 1951).
- Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2349 (2014).
- AT&T Knowledge Ventures; Re CVON Innovations [2009] EWHC 343 (Pat).
- Bascom Glob. Internet Servs. v. AT&T Mobility LLC, 827 F.3d 1341, 1349 (Fed. Cir.2016).
- Bilski v. Kappos 561 U.S. 593 (2010) 13.
- Bleistein v. Donaldson Lithographing Co., 188 U.S. 239, 250 (1903).
- Burrow-Giles Lithographic Co. v. Sarony, 111 U.S. 53, 59 (1884).
- Case C-145/10 Eva-Maria Painer v Standard Verlags GmbH, ECDR 6.
- Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980).
- Eldred v. Ashcroft, 537 U.S. 186, 244 (2003).
- European Patent Office, Programs for Computers G03/08, Para 10.7.2 (2010) <https://www.epo.org/law-practice/case-law-appeals/recent/g080003ex1.html>

- Enfish, LLC v. Microsoft Corp., 822 F.3d 1327, 1330 (Fed. Cir. 2016).
- EPO Board of Appeals, T 0208/84 (Computer-related invention), 1986.
- Express Newspapers plc v Liverpool Daily Post & Echo plc and Others [1985] 1 WLR 1089.
- Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 345 (1991).
- Football Dataco Ltd and others v. Yahoo! UK Ltd and others, Case C-604/10, 2012, ECDR.
- Fujitsu's Application [1996] RPC 511, 521
- Graham v. John Deere Co., 383 U.S. 1 (1966).
- HTC v Apple [2013] EWCA Civ 451.
- IBM/Computer programs, T1173/97 [2000] EPOR 219, 226.
- Infopaq International A/S v Danske Dagblades Forening (C-5/08) EU:C:2009:465; [2012] Bus. L.R. 102
- Kogan v Martin [2019] EWCA Civ 1645; [2020] E.M.L.R. 4.
- KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 418 (2007).
- McRO, Inc. v. Bandai Namco Games Am. Inc., 837 F.3d 1299, 1314 (Fed. Cir. 2016)
- Microsoft/Clipboard formats I T0424/03 (23 Feb 2006), para 5.1.
- Molecular Pathology v. Myriad Genetics, 569 U.S. 576, 589 (2013).
- Montgomery v. Noga, 168 F.3d 1282, 1292 (11th Cir. 1999).
- Naruto v. Slater, 2016 U.S. Dist. LEXIS 11044 at 4 (N.D. Cal. 2016).
- Nova Productions v Mazooma Games [2007] EWCA Civ. 219; [2007] Bus. L.R. 1032.
- Pension Benefit Systems Partnership, T931/95 [2001] OJEPO 441, 449. (TBA).
- Rearden, LLC v. Walt Disney, 293 F. Supp. 3d 963 (N.D. Cal. 2018).
- Redwood Music Ltd. v. Chappell & Co. Ltd., [Q.B. 1982] R.P.C. 109, 120.

Symbian v Comptroller General of Patents, Designs and TradeMarks [2008] EWHC 518 (Pat)

Torah Soft v. Drosnin, 136 F. Supp. 2d 276, 292 (S.D.N.Y. 2001).

University of Southampton's Applications, Reports of Patent, Design and Trade Mark Cases, Volume 122, Issue 7, 2005, Pages 220–242, <https://doi.org/10.1093/rpc/2005rpc11>

University of Utah v. Max-Planck-Gesellschaft Zur Forderung Der Wissenschaften EV, 734 F.3d 1315, 1323 (Fed. Cir. 2013).

Urantia Found. v. Maaherra, 114 F.3d 955, 963-64 (9th Cir. 1997).

Walter v. Lane [1900] A.C. 539.

### Secondary Sources

Abbott, Ryan. 'I Think, Therefore I Invent: Creative Computers and the Future of Patent Law'. *Boston College Law Review* 57 (2016): 1079. <https://heinonline.org/HOL/Page?handle=hein.journals/bclr57&id=1080&div=&collection=>.

———. *The Reasonable Robot: Artificial Intelligence and the Law*. 1st ed. Cambridge University Press, 2020. <https://www.cambridge.org/core/product/identifier/9781108631761/type/book>.

Balaban, Jonathan. 'How WaveNet Works'. Medium, 10 May 2019. <https://towardsdatascience.com/how-wavenet-works-12e2420ef386>.

Bosher, Hayleigh, Olga Gurgula, Simon Stokes, and Faye Wang. 'WIPO Impact of Artificial Intelligence on IP Policy Response from Brunel University London, Law School & Centre for Artificial Intelligence'. Brunel University London, 2020.

Bracha, Oren. 'The Ideology of Authorship Revisited: Authors, Markets, and Liberal Values in Early American Copyright'. *Yale LJ* 118 (2008): 186.

Bridy, Annemarie. 'Coding Creativity: Copyright and the Artificially Intelligent Author'. *Stan. Tech. L. Rev.* 5 (2012).

———. 'The Evolution of Authorship: Work Made by Code'. *Colum. JL & Arts* 39 (2015): 395.

- Chimuka, Garikai. 'Impact of Artificial Intelligence on Patent Law. Towards a New Analytical Framework – [ the Multi-Level Model]'. *World Patent Information* 59 (December 2019): 101926. <https://linkinghub.elsevier.com/retrieve/pii/S0172219018300814>.
- TensorFlow. 'DeepDream | TensorFlow Core'. Accessed 4 August 2020. <https://www.tensorflow.org/tutorials/generative/deepdream>.
- Dorotheou, Emily. 'Reap the Benefits and Avoid the Legal Uncertainty: Who Owns the Creations of Artificial Intelligence'. *Computer and Telecommunications Law Review* 21, no. 4 (2015): 85.
- Dusollier, Séverine. 'Scoping Study on Copyright and Related Rights and the Public Domain'. *World Intellectual Property Organisation Publication*, 2011.
- Featherstone, Emma. 'Introducing the next Generation of Music Makers'. *The Guardian*, 29 August 2017, sec. Guardian Small Business Network. <https://www.theguardian.com/small-business-network/2017/aug/29/computer-write-music-jukedek-artificial-intelligence>.
- Fraser, Erica. 'Computers as Inventors – Legal and Policy Implications of Artificial Intelligence on Patent Law'. *SCRIPTed* 13, no. 3 (16 December 2016): 305–33. <https://doi.org/10.2966/scrip.130316.305>.
- Gervais, Daniel J. 'The Machine as Author'. *Iowa Law Review* 105 (2019): 19–35.
- Grimes, William. 'Harold Cohen, a Pioneer of Computer-Generated Art, Dies at 87'. *The New York Times*, 6 May 2016, sec. Arts. <https://www.nytimes.com/2016/05/07/arts/design/harold-cohen-a-pioneer-of-computer-generated-art-dies-at-87.html>.
- Guadamuz, Andres. 'Do Androids Dream of Electric Copyright? Comparative Analysis of Originality in Artificial Intelligence Generated Works'. *I.P.Q.*, 2017, 169.
- Hattenbach, Ben, and Joshua Glucoft. 'Patents in an Era of Infinite Monkeys and Artificial Intelligence'. *Stan. Tech. L. Rev.* 19 (2015): 32.

- Heathman, Amelia. 'IBM Watson Creates the First AI-Made Film Trailer – and It's Incredibly Creepy'. *Wired UK*, 2 September 2016. <https://www.wired.co.uk/article/ibm-watson-ai-film-trailer>.
- Hedrick, Samantha Fink. 'I Think, Therefore I Create: Claiming Copyright in the Outputs of Algorithms'. *NYU J. Intell. Prop. & Ent. L.* 8 (2018): 324.
- Hristov, Kalin. 'Artificial Intelligence and the Copyright Dilemma'. *IDEA: The Journal of the Franklin Pierce Center for Intellectual Property* 57, no. 3 (2017 2016): 431. <https://heinonline.org/HOL/Page?handle=hein.journals/idea57&id=449&div=&collection=>.
- Intellectual Property Office, 'Formalities Manual Chapter 3.05: The Inventor', (28 October 2019), <https://www.gov.uk/guidance/formalities-manual-online-version/chapter-3-the-inventor>
- Kasner, Alexander J. 'The Original Meaning of Constitutional Inventors: Resolving the Unanswered Question of the MadStad Litigation'. *Stan. L. Rev. Online* 68 (2015): 24.
- Kim, Austin J., and Matthew Horton. 'USPTO Confirms Inventorship as Limited to Natural Human Beings'. LexBlog, 30 April 2020. <https://www.lexblog.com/2020/04/30/uspto-confirms-inventorship-as-limited-to-natural-human-beings/>.
- Liebman, Yvette Joy. 'The Wisdom of Legislating for Anticipated Technological Advancements'. *J. Marshall Rev. Intell. Prop. L.* 10 (2010): 153.
- Lim, Daryl. 'AI & IP: Innovation & Creativity in an Age of Accelerated Change'. *Akron Law Review* 52 (2018): 813. <https://heinonline.org/HOL/Page?handle=hein.journals/aklr52&id=837&div=&collection=>.
- Office, European Patent. 'EPO Publishes Grounds for Its Decision to Refuse Two Patent Applications Naming a Machine as Inventor'. Accessed 6 August 2020. <https://www.epo.org/news-events/news/2020/20200128.html>.
- Palace, Victor M. 'What If Artificial Intelligence Wrote This: Artificial Intelligence and Copyright Law'. *Fla. L. Rev.* 71 (2019): 217.

- Patenting Artificial Intelligence Conference Summary, 10. European Patent Office, 2018. <https://www.epo.org/news-events/events/conferences/2018/ai2018.html>.
- Pila, Justine. 'Dispute over the Meaning of "Invention" in Article 52 (2) EPC—The Patentability of Computer-Implemented Inventions in Europe'. *IIC* 36 (2005): 173–91.
- Plotkin, Robert. *The Genie in the Machine: How Computer-Automated Inventing Is Revolutionizing Law and Business*. Stanford University Press, 2009.
- Rahmatian, Andreas. 'Originality in UK Copyright Law: The Old "Skill and Labour" Doctrine under Pressure'. *IIC-International Review of Intellectual Property and Competition Law* 44, no. 1 (2013): 4–34.
- Ramalho, Ana. *The Competence of the European Union in Copyright Lawmaking: A Normative Perspective of EU Powers for Copyright Harmonization*. Springer, 2016.
- Samuelson, Pamela. 'Allocating Ownership Rights in Computer-Generated Works'. *University of Pittsburgh Law Review* 47 (1986 1985): 1185. <https://heinonline.org/HOL/Page?handle=hein.journals/upitt47&id=1203&div=&collection=>.
- Simon, Brenda M. 'The Implications of Technological Advancement for Obviousness'. *Michigan Telecommunications and Technology Law Review* 19 (2013): 331.
- Illuminate Productions. 'Six Robots Named Paul'. Accessed 4 August 2020. <https://www.illuminateproductions.co.uk/six-robots-named-paul>.
- Sprigman, Christopher Jon. 'Copyright and Creative Incentives: What We Know (and Don't)'. *Hous. L. REv.* 55 (2017): 451.
- The Painting Fool - A Computer Artist. Accessed 4 August 2020. <http://www.thepaintingfool.com/>.
- Thorn, Paul D. 'Nick Bostrom: Superintelligence: Paths, Dangers, Strategies'. *Minds and Machines* 25, no. 3 (2015): 285–89.
- Turner, Jacob. 'Legal personality for AI.' Robot Rules. Palgrave Macmillan, Cham, (2019)

Vertinsky, Liza. ‘Thinking Machines and Patent Law’. In *Research Handbook on the Law of Artificial Intelligence*, edited by Woodrow Barfield and Ugo Pagallo, 489–522. Cheltenham, UK: Edward Elgar Publishing, 2018.