The player, the programmer and the AI: a copyright odyssey in gaming

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1. Introduction

New technologies have posed (new) challenges for intellectual property (IP) laws. There are several questions being raised over the intersection between IP and new technologies; questions emerged when computers and related devices started producing works or products or performing creative activities that were originally only done by humans. The creative industry encompasses fields such as film, video games, photography and music, all of which are subject to copyright and related rights. Video games are one of the most interesting and contemporary fields where one can observe the interplay between emerging technologies and intellectual property rights (IPRs). With the advent of new technologies, this area has undergone significant changes and has introduced new products that blend human creativity with the use of tools and techniques in a way that was once unimaginable. Digital media and environments have greatly influenced this area, making it challenging to apply traditional principles and rules of copyright and related rights. It is crucial to consider a combination of principles and their exceptions to avoid the system from becoming stagnant or hindering further innovation and creativity.

Several questions have been raised about the intersection between IP and artificial intelligence (AI), including whether IPRs should be conferred on AI and what works should be considered original. These questions have been the subject of discussions and debates in various fora, such as the World Intellectual Property Organisation (WIPO). Conversation on AI and IP, as part of the WIPO conversations on IP and frontier technologies, is needed.[1] WIPO Conversations aim to provide a platform for stakeholders to discuss the impact of frontier technologies on IP rights and bridge the information gap in this rapidly changing field.

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1 WIPO 'The WIPO Conversation on Intellectual Property and Artificial Intelligence' Available at www.wipo.int/about-ip/en/artificial_intelligence/conversation.html%20 (accessed 7 October 2023).

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Abstract

- The advancement of machine learning and artificial intelligence (AI) technology has fundamentally altered the production and ownership of works, including video games. That is because, with the development of AI systems, machines are now capable of not only producing works that are similar to existing ones but also creating works that are truly original and creative.

- The question of how such works should be protected under copyright law is a complex and evolving one. It is crucial to take into account the numerous approaches that have been proposed in this regard for the copyright protection of AI-generated works alongside related criticisms. Regardless of the approach employed, the issue of copyright protection for AI-generated works becomes more complicated if one considers the exclusive rights copyright holders enjoy, such as the communication to the public right via video game streaming.

- It will be feasible to create a framework for the protection of AI-generated works that is fair, effective and responsive to the requirements of both creators and users by carefully examining the legal and practical challenges involved.

Some IP offices have also taken steps to address these concerns. The United Kingdom Intellectual Property Office addressed the intersection of IP and AI as part of

its 'National AI Strategy'. Two consultations were held, the first one in 2020 asking for broad views on the topic, and the second one in October 2021 focusing on text and data mining exceptions to copyright infringement, copyright protection for computer-generated works and patent protection for AI-generated inventions. The response to the second consultation[2] recommended that the UK should:

i) adopt a broad copyright exception for text and data mining (though—according to the latest update—this will not be implemented[3]);

ii) maintain its current framework for copyright protection of AI-generated works, as there is no evidence that the protection of such works is harmful and AI is at its early stages; and

iii) keep the current patent framework that prohibits patents on AI-generated inventions.

Although enabling legal protection for works generated by AI can help foster the growth and utilization of creative AI, which can result in more creative works being produced through AI and encourage their widespread commercial dissemination,[4] many jurisdictions, such as the USA, provide that 'human authorship is a prerequisite to copyright protection' and that 'copyright law only protects the fruits of intellectual labor'.[5] More recently, a federal district court in the District of Columbia dismissed Thaler's attempt to register a copyright for an artwork generated by his AI system and highlighted that 'Human authorship is a bedrock requirement of copyright'.[6]

In terms of IPRs, this article will focus on copyright law, which protects original creative expressions by granting creators of original works exclusive rights over the use and distribution of their creations. It will do so through a discussion of the integration of AI into games, focusing on whether AI-generated works can be protected by copyright and attempting to provide clarification about authorship in terms of in-game creativity. Specifically, it considers who should be considered the author and owner of creative expressions when they are produced by players during a game while certain interactions are driven or controlled by AI.

2. AI in video games

AI is commonly used in video games because it enhances engagement, enjoyment and replay value.[7] It has been identified that AI plays a crucial role in four specific sub-areas of video game production: (i) developing and controlling non-playable characters (NPCs); (ii) personalizing games to individual users based on their characteristics; (iii) tracking and analysing gamers' data to model their player experience; and (iv) improving and optimizing the development and distribution of video games.[8] This paper focuses on one specific AI application in video games to demonstrate the complex interplay between property, AI and gaming: Procedural Content Generation (PCG) in adaptive games. A recent study conducted by Bonadio and Trapova also delved into PCG and NPCs in video games, specifically addressing the central issues of authorship of user-generated output in games and originality of AI-driven PGC.[9] Analysing the legal frameworks and case law in Europe, the authors provided insights into the complex legal (copyright and patent law) considerations surrounding AI applications in the video game industry.

Gaming has been and will be further shaped by the dynamic and promising field of AI. AI is defined as 'a system's ability to correctly interpret external data, to learn from such data and to use those learnings to achieve specific goals and tasks through flexible adaptation'.[10] Although the roots of AI date back to the 1940s, the term 'AI' was officially coined in 1955 to describe the science and technology of producing intelligent machines.[11] The history of AI and that of gaming are inextricably linked. Back in the early stages of video games, AI was incorporated into games, for the appearance, movement and interaction of NPCs with the player.[12]

2   UK Government 'Artificial Intelligence and Intellectual Property: Copyright and Patents: Government Response to Consultation' (28 June 2022). Available at www.gov.uk/government/consultations/artificial-intelligence-and-ip-copyright-and-patents/outcome/artificial-intelligence-and-intellectual-property-copyright-and-patents-government-response-to-consultation (accessed 7 October 2023).

3   UK Parliament 'Chapter 2: A Digital Future' Available at https://publications.parliament.uk/pa/ld5803/ldselect/ldcomm/125/12505.htm#_idTextAnchor019 (accessed 7 October 2023).

4   R Abbott and E Rothman, 'AI-generated Output and Intellectual Property Rights: Takeaways from the Artificial Inventor Project' (2023) 45 EIPR 215.

5   US Copyright Office 'Compendium of U.S. Copyright Office Practices (Third)' § 306. Available at www.copyright.gov/comp3/chap300/ch300-copyrightable-authorship.pdf (accessed 12 May 2023).

6   Thaler v Perlmutter, Case 1:22-cv-01564-BAH, D.I. 24, Memorandum Opinion at 13 (DDC, 18 August 2023).

7   K Izsak and others 'Opportunities and Challenges of Artificial Intelligence Technologies for the Cultural and Creative Sectors' (European Commission 2022) SMART 2019/0024 30. Available at https://op.europa.eu/en/publication-detail/-/publication/359880c1-a4dc-11ec-83e1-01aa75ed71a1/language-en (accessed 7 October 2023).

8   ibid.

9   E Bonadio and A Trapova 'Intellectual Property Law in Gaming and Artificial Intelligence' in C Bevan (ed) Handbook on Property Law and Theory (Elgar Forthcoming Cheltenham 2024).

10 M Haenheim and others, 'Artificial Intelligence (AI) and Management Analytics' (2019) 6 Journal of Management Analytics 341.

11 J McCarthy and others, 'A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence 31 August 1955' (2006) 27 AI Magazine 12.

12 H Lou 'AI in Video Games: Toward a More Intelligent Game' (Science in the News, Harvard University, 28 August 2017). Available at http://sitn.hms.harvard.edu/flash/2017/ai-video-games-toward-intelligent-game/ (accessed 20 July 2023).

Wang describes machine learning as a type of AI, which enables programs to learn to perform a task (e.g., recognition, classification, detection and robotic tasks) after having studied a set of example data.[13] The program will analyse the data and create outputs (including music, movies, literature and art) thereof, which often are not predictable to the people who developed the initial program and this process can be concluded despite the absence of substantial human intervention.[14]

The potential of AI has been observed in different forms of art. Within the music industry, machine learning is employed in the programs *Jukedeck* and *Artificial Intelligence Virtual Artistic*, both of which can compose music via an algorithm, which is then available to customers as an MP3 file.[15] AI is also capable of producing literature, including novels and poems. For instance, the program *Brutus* writes short stories characterized by intrigue and mystery,[16] while the Swedish theatre play *Nattygsbordet* is written entirely by AI.[17] In addition, AI can create visual art. A well-known example is the 'Next Rembrandt' project, the generation of a new 3D-printed painting produced by data scanned from the Dutch maestro's artworks.[18] It is evident that programs or machines have learnt to mimic human creativity, and thus, according to Bonadio and McDonagh, 'the copyright world has entered into AI-driven uncharted territory'.[19]

The question that automatically arises is whether an AI-generated work is copyright protected and, if so, who the author and owner of such works are. For example, AI can be trained to produce its own game, after 'watching' hours of videos showing people playing the game, as the software is able to guess at the rules of the game.[20]

3. Unravelling the authorship debate

Following the discussion that AI can produce creative works, the question that automatically arises is whether an AI-generated work is copyright-protected and, if so, who the author and owner of such works are. This question is not a new one. In the USA, back in 1965, the US Register of Copyright expressed concern about the development of computer technology,[21] and more than a decade later, the US National Commission on New Technological Uses of Copyright Works ('CONTU Commission') concluded in 1978 that computers used for the production of works were 'inert instrument[s]'.[22] However, the CONTU Commission's approach was accused of being too simplistic and the US Congress Office of Technology Assessment later recognized that 'it is misleading, however, to think of programs as inert tools of creation, in the sense that cameras, typewriters or any other tools of creation are inert'.[23]

Many scholars have been interested in the question of who qualifies as the author of AI-generated works.[24] This question is crucial because under copyright law there is the assumption that authors are human, and since copyright duration is linked to the life of an author it is believed that it follows an anthropocentric view.[25] For example, French copyright law states that only a natural person can be the author,[26] and German copyright law provides that copyright protects the author in their relationship to the work.[27] From a European perspective,

13 FF Wang, *Online Arbitration* (Informa Law 2017) 98.

14 E Bonadio and L McDonagh, 'Artificial Intelligence as Producer and Consumer of Copyright Works: Evaluating the Consequences of Algorithmic Creativity' (2020) 2 *Intellectual Property Quarterly* 112. This process is also defined as 'algorithmic creativity'.

15 E Featherstone 'Introducing the Next Generation of Music Makers' (*The Guardian*, 29 August 2017). Available at www.theguardian.com/small-business-network/2017/aug/29/computer-write-music-jukedeck-artificial-intelligence (accessed 4 July 2023).

16 S Bringsjord and D Ferrucci *Artificial Intelligence and Literary Creativity: Inside the Mind of BRUTUS, a Storytelling Machine* (Lawrence Erlbaum Associates Mahwah, NJ 2000) 25.

17 T Kempas, 'A Note on Artificial Intelligence and Intellectual Property in Sweden and the EU' (2020) 3 *Stockholm Intellectual Property Law Review* 54, 58.

18 C Baraniuk 'Computer Paints "New Rembrandt" after Old Works Analysis' (*BBC*, 6 April 2016). Available at www.bbc.co.uk/news/technology-35977315 (accessed 4 July 2023).

19 Bonadio and McDonagh (n 14).

20 M Gault 'How Artificial Intelligence Could Help Video Gamers Create the Exact Games They Want to Play' (*Time*, 10 February 2020). Available at https://time.com/5779217/artificial-intelligence-video-games/ (accessed 4 July 2023).

21 US Copyright Office, *68th Annual Report of the Register of Copyrights* (Washington, 1965) 5.

22 US National Commission on New Technological Uses of Copyrighted Works (CONTU Commission) 'Final Report' (1978) 44. Available at www.tech-insider.org/intellectual-property/research/acrobat/780731.pdf (accessed 7 October 2023).

23 US Office of Technology Assessment, *Intellectual Property Rights in an Age of Electronics and Information* (US Government Printing Office Washington DC 1986) 72.

24 T Butler, 'Can a Computer Be an Author?' (1982) 4 *Hastings Communications and Entertainment Law Journal* 707; AR Miller, 'Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?' (1993) 106 *Harvard Law Review* 977; AJ Wu 'From Video Games to Artificial Intelligence: Assigning Copyright Ownership to Works Generated by Increasingly Sophisticated Computer Programs' (1997) 25 *AIPLA Q L* 131; S Yanisky-Ravid, 'Generating Rembrandt: Artificial Intelligence, Copyright, and Accountability in the 3A Era – the Human-Like Authors Are Already Here – A New Model' (2017) *Michigan State Law Review* 659, 675; CE Mammen and C Richey, 'AI and IP: Are Creativity and Inventorship Inherently Human Activities?' (2020) 14 FIU Law Review 275, 283; P Bernt Hugenholtz and JP Quintais, 'Copyright and Artificial Creation: Does EU Copyright Law Protect AI-Assisted Output?' (2021) 52 *ICC* 1190.

25 S Ricketson and JC Ginsburg *International Copyright and Neighbouring Rights: The Berne Convention and Beyond Two Volume Set* (2nd edn Oxford University Press 2006) pt 1.

26 Code de la Propriété Intellectuelle 1994, art L112-1.

27 Gesetz über Urheberrecht und verwandte Schutzrechte—Urheberrechtsgesetz 1965, section 11.

the concept of authorship is highly associated with the originality requirement. In the *Infopaq* case, the Court of Justice of the European Union (CJEU) emphasized the 'author's own intellectual creation',[28] and in *Painer* it clarified that the intellectual creation reflects the personality of the author.[29] Moreover, the CJEU has stated that the exclusive rights granted to authors under the InfoSoc Directive apply exclusively to human creators, not to legal entities like film producers or publishers.[30] Advocate General Trstenjak, in her Opinion in *Painer*, went so far as to argue that the protection offered by copyright law only applies to human creations, even if technical aids such as cameras were used to create them.[31] The CJEU agreed with this interpretation, endorsing the view that copyright protection is reserved for works created by humans. Therefore, in Europe it is suggested that the originality criterion involves some degree of human authorship.[32] The UK explicitly permits the protection of works generated by AI. Under UK law, AI-generated works have a shorter period of protection (50 years from the year of creation) than works produced by traditional authors (70 years after the author's death). The person who made the necessary arrangements is deemed to be the author under UK law.[33] Although the protection of AI-generated works under section 9(3) of the Copyright, Designs and Patents Act 1988 (CDPA) has only been raised tangentially in one legal case,[34] there may be several reasons for the lack of legal precedents on this matter. First, AI-generated works have only recently begun to have commercial value and, historically, works without commercial value have not been the subject of litigation; as such, there has been limited litigation concerning

copyright protection in the UK. Second, even if there were a challenge to the subsistence of a work, section 9(3) would make it difficult to contest.

Section 9(3) introduces an intriguing legal concept by inventing a fictional authorship for computer-generated works, even though such works are inherently devoid of human authors. In essence, this provision extends comprehensive copyright protection to computer-generated works by attributing authorship to the most plausible human responsible for orchestrating the work's creation when there is no identifiable human author in the traditional sense.

That said, the CDPA encounters difficulties when confronted with the intricacies of AI-generated works. Back in the 1980s, when this provision was established, identifying a human author was straightforward because humans were directly involved in programming computer-generated outputs. The landscape has evolved, and AI-generated works differ qualitatively from their predecessors, as they do not rely on substantial human creativity.[35] Despite remarkable technological progress, the CDPA has remained unaltered since its inception. Consequently, this provision fails to offer clear guidance in its legal application to contemporary, increasingly autonomous works, particularly regarding the identification of the individual responsible for the 'necessary arrangements'. Davis and Aplin have noted that the wording of the provision is 'ambiguous and subject to interpretation.'[36]

Hence, establishing human authorship hinges on a person's level of involvement in the creative process. In the context of *Nova*, it is evident that the programmer played a pivotal role and should be the copyright holder. However, allocating copyright is not always a straightforward binary determination, especially when it pertains to AI-generated works. Given the massive amounts of data and the intricate process involved in training an algorithm, various stakeholders contribute significantly to the development of AI software. For instance, in the case of *DALL-E*, the AI was not trained on raw internet data but rather on 650 million images licensed by OpenAI, which were used as input for the algorithm.[37] Beyond programmers, AI companies, investors, trainers, software engineers, data providers and machine operators all play

28 Case C-5/08 *Infopaq International A/S v Danske Dagblades Forening* [2009] ECLI:EU:C:2009:465, para 35.

29 Case C-145/10 *Painer v Standard Verlags GmbH* [2011] ECLI:EU:C:2011:798, para 88.

30 Council Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society [2001] OJ L 167/10; Case C-277/10 *Luksan v van der Let* [2012] ECLI:EU:C:2012:65; Case C-572/13 *Hewlett-Packard Belgium SPRL v Reprobel SCRL* [2015] ECLI:EU:C:2015:750.

31 Opinion AG Trstenjak in Case C-145/10 *Painer* [2011] ECLI:EU:C:2011:239, para 121.

32 Bonadio and McDonagh (n 14).

33 Copyright, Designs and Patents Act 1988, s 9(3).

34 *Nova Productions Ltd v Mazooma Games Ltd* [2006] RPC 379; *Nova Productions v Mazooma Games and Others* has implied that the author could be the software programmer who designed the algorithm generating the final output. In determining whether the author of the visual display was the programmer or the user, Kitchin J delivered a ruling, stating: 'In so far as each composite frame is a computer-generated work then the arrangements necessary for the creation of the work were undertaken by [the programmer] Mr Jones because he devised the appearance of the various elements of the game and the rules and logic by which each frame is generated and he wrote the relevant computer program.' The court awarded copyright to the programmer for the composite frames.

35 J-A Lee 'Computer-Generated Works under the CDPA 1988' in J-A Lee, R Hilty, and K-C Liu (eds) *Artificial Intelligence and Intellectual Property* (Oxford University Press Oxford 2021) 178.

36 J Davis and T Aplin *Intellectual Property Law: Text, Cases, and Materials* (Oxford University Press Oxford 2021) 135.

37 B Allyn 'Surreal or Too Real? Breathtaking AI tool DALL-E Takes its Images to a Bigger Stage' (*NPR*, 20 July 2022). Available at www.npr.org/2022/07/20/1112331013/dall-e-ai-art-beta-test (accessed 20 October 2023).

crucial roles in the design process. It would be arbitrary to presume that the programmer consistently represents the individual who makes the 'necessary arrangements' for the work.[38]

Unlike the UK approach, in September 2022 a registrant registered, with the US Copyright Office, a comic book for which an AI image generator had created all the images and which contained AI-generated text.[39] The registrant identified herself as the author and compiler of the work. However, on 28 October 2022, the Copyright Office notified the registrant that the registration might be cancelled, requesting details of the creation process to demonstrate that there was substantial human involvement.[40] Recently, the Register of Copyright, Shira Perlmutter, discussed how the copyrightability of a work may depend on the complexity of the AI prompt used, and that it is a question that depends on the specific circumstances of each case.[41]

In an effort to understand who the author of an AI output should be, there are different approaches that have been proposed. Wu has suggested a multi-step analysis in order to determine the authorship of AI-generated works.[42] According to his recommendation, the first step is to determine whether the AI-generated work is a derivative work based on the program; if the work is a derivative work, then the programmer has the exclusive right to generate derivative works based on the underlying work.[43] On the contrary, if the output is not a derivative work, then the court has to determine whether the generated work is repetitive and predictable; if so, then the programmer should be considered the author of the work.[44] Then, the court has to consider the user's input; where the user's input is a simple command, such as 'compose', the user should not be considered the author. If both the programmer and the user meet the requirements of the previous two steps, the courts should consider whether there was the intention of joint authorship. In the event that the output is not repetitive or predictable

and the user's contribution was minimal, then, according to Wu, the AI itself may be the author. Finally, if the court finds that the AI is the author, it has to be examined whether the AI is sophisticated enough to decide upon the production of future works.[45]

The requirement of human authorship as a precondition for copyright was not challenged in the early days when computer programs were initially used to generate imaginative works, as these programs were viewed as mere tools that facilitated the creative process, similar to a pen or a camera. The outcome of the creative process was predictable because the programmer was directly engaged at every stage of the design and creation process.[46] However, with the recent advancements in generative AI, the computer program has evolved beyond being a simple tool; it now independently makes creative decisions, separate from the original programmer's direct involvement. For instance, software engineers have clarified that they do not exert full control over the final output:

> Instead of exactly prescribing which feature we want the network to amplify…we simply feed the network an arbitrary image or photo and let the network analyse the picture. […] Each layer of the network deals with features at a different level of abstraction, so the complexity of features it generates depends on which layer it chooses to enhance.[47]

The potential for varied outcomes implies that the algorithm's programmers cannot predict how the AI will express the images it produces. This 'unpredictability' severs the direct link between human authors and the software's output. While the programmers may initiate the development of the application, they do not directly control the results of the application's creative process. Therefore, it cannot be asserted that AI-generated outputs represent the 'author's own intellectual creation'. The limited (detectable) human contribution falls short of meeting the threshold of originality necessary to justify copyright protection.

In the USA, the 'work made for hire' doctrine has been suggested, as it perceives AI-generated works as equivalent to works produced in the course of their

38 Bonadio and McDonagh (n 14).

39 US Copyright Registration, Type of Work: Visual Material, Registration Number/Date: VAu001480196/15 September 2022, Application Title: Zarya Of The Dawn. Description: Electronic file (eService), Copyright Claimant: Kristina Kashtanova, Domicile: United States. Authorship: Comic book.

40 IPWatchdog 'U.S. Copyright Office Backtracks on Registration of Partially AI-Generated Work' (1 November 2022). Available at https://ipwatchdog.com/2022/11/01/us-copyright-office-backtracks-registration-partially-ai-generated-work/id=152451/ (accessed 7 October 2023).

41 Digital Media Licensing Association 'Shira Perlmutter Discusses Generative AI, Prompt Engineering and Copyright' (*YouTube*, 2 November 2022). Available at www.youtube.com/watch?v=1ZdOI2inQ4A (accessed 7 October 2023).

42 Wu (n 24) 173.

43 ibid.

44 ibid.

45 ibid.

46 T Aplin and G Pasqaletto, 'Artificial Intelligence and Copyright Protection' in RM Ballardini, P Kuoppamäki and O Pitkänen (eds) *Regulating Industrial Internet Through IPR, Data Protection and Competition Law* (Kluwer The Netherlands 2019) 432.

47 A Mordvintsev, C Olah and M Tyka 'Inceptionism: Going Deeper into Neural Networks' (*Google Blog*, 18 June 2015). Available at https://ai.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html (accessed 7 October 2023).

employment.[48] However, this approach has been criticised, because it recognizes machine-employees, raising questions about the legal rights and duties under employment agreements.[49] The UK has adopted a more 'pragmatic' approach, embodied in section 9(3) of the CDPA 1988, which provides that 'in the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken'. This approach has also been criticised because it seems to constitute an exception to the originality requirement, as interpreted by the UK courts pre-*Infopaq*; a work was considered original if it was the result of its author's 'skill, labour and judgement'.[50] Wang pointed out that although an AI algorithm should not be given legal personality, AI-generated work should be protected and the most appropriate persons/authors 'for such protection are humans who make primary necessary arrangements including the creators/programmers/developers and designers of identified primary AI algorithms, the persons who select, input and train the data and the operators/users of AI algorithms'.[51]

The arguments in favour of the programmer being deemed author emphasize the intellectual conception of the output, or, in other words, that the programmer has imagined it,[52] which entails Wu's element of predictability.[53] Proponents of this approach claim that 'users' merely press a button, which does not employ any intellectual creativity. This argument sees the programmer as the 'author of the authors'.[54] The arguments in favour of the user as sole author note the element of creativity that the user puts in the work, which perceives the programmer and the machine as mere tools.[55] The AI itself has been suggested to be the author, where the output is not predictable by the programmer, there is no user, joint authorship is not an option, and the AI has discretion to decide whether it will produce works in the future.[56] As becomes apparent, the more independent the

AI becomes, the harder it is to identify a human being responsible for the arrangements.[57] Wang further proposed that if this becomes an issue, 'legal and technical mechanisms should be established to determine humans who make primary necessary arrangements for identified primary AI algorithms'.[58]

Authorship and the requirement of originality are the central issues in copyright and AI. The main international instrument governing copyright law, the Berne Convention, establishes certain basic standards. While the Convention permits its members to impose more rigorous criteria for copyright protection, it does not explicitly define the concept of an 'author'.[59] However, by examining the different provisions of the Convention, one could find indications regarding the definition of an author in copyright law. With the rise of AI in gaming it is very challenging to identify human involvement in complex computational processes. Using PCG as an example, instead of pre-coding all potential game maps and worlds in advance, developers now rely on intricate machine learning mechanisms to automatically generate an infinite variety of creative content during gameplay. Consequently, it becomes difficult to attribute authorship of these limitless outputs to the developers, as the connection between them and the resulting content is so tenuous that it no longer qualifies as the intellectual creation of the programmers. Therefore, the developers cannot be considered the authors of these endless outputs due to the diminished link, known as the originality causation.[60]

Gervais discussed the challenging task of establishing causation in determining the originality of creative works produced by AI systems[61] The proposed test aims to differentiate between instances where a human programmer or user can be considered the author of at least part of an AI-generated work and cases where they cannot. To apply this test, the focus is on identifying whether the creative choices made by humans, either through code or instructions given to the AI system, directly influence the resulting AI-generated work, which the court must evaluate for originality. This approach acknowledges that, in the context of deep learning AI, the AI's output is often not predictably contained within the code or instructions provided.

48   Bonadio and McDonagh (n 14).
49   Butler (n 24).
50   Bonadio and McDonagh (n 14).
51   Copyright, Designs and Patents Act 1988, s 9(3). See also F Wang 'AI and Intellectual Property Rights: IPR Protection for AI-Created Work' (Speech at the Evidence Meeting of AI and Intellectual Property Rights: IPR Protection for AI-Created Work for All-Party Parliamentary Group (APPG), 24 January 2022). Available at www.youtube.com/watch?v=E3wMWldnIPM (accessed 4 July 2023).
52   Bonadio and McDonagh (n 14).
53   Wu (n 24).
54   A Bridy, 'The Evolution of Authorship' (2016) 39 *Columbia Journal of Law & the Arts* 395.
55   Bonadio and McDonagh (n 14); Wu (n 24).
56   ibid, Bonadio and McDonagh.

57   Bonadio and McDonagh (n 14).
58   Wang, 'AI and Intellectual Property Rights' (n 51).
59   The Berne Convention for the Protection of Literary and Artistic Works (adopted in 1886, entered into force 5 December 1887) 1161 UNTS 30 (Berne Convention).
60   Daniel Gervais, 'The Machine as Author' (2020) 105 *Iowa law Review* 2053, 2100.
61   ibid.

The player emerges as an alternative candidate for authorship. In PCG, the player's input serves as a prompt for generating creative content. Bonadio's recent paper explores the interactive entertainment tool AI Dungeon as a case study,[62] a multiplayer text-based adventure game that relies on AI technology. AI Dungeon can be more accurately categorized as an 'interactive entertainment tool' rather than a traditional game. The gameplay follows a simple process where the player supplies the AI with prompts categorized as 'do', 'say', 'story' or 'see'. The AI system generates responses based on these prompts, and the player reacts to the generated sentences or images using the four available functions. This interaction continues back and forth until the player decides to conclude the story. If the player contributes to the text generation by providing longer and more intricate sentences using the 'story' function, it is possible that the player could be considered the author of that specific segment, assuming that the requirement of originality is met. However, the situation becomes more complex due to the AI's ability to generate lengthy and precise responses that influence the player's subsequent reactions. This complexity is further heightened by OpenAI's *ChatGPT*, a machine learning tool designed to provide detailed responses based on prompts.[63] These computational intricacies raise doubts about the extent to which the player can claim sole authorship of the final generated text. Moreover, the authorship claims become even more intricate when considering that AI Dungeon allows multiplayer gameplay, involving multiple users interacting with the AI.

Regarding the other crucial aspect to consider, which is the requirement of originality, it is important to emphasize that copyright law does not align with the philosophical, psychological or aesthetic understanding of originality.[64] In the context of copyright, originality does not necessarily imply novelty. Instead, in the European Union's (EU) copyright law, 'originality' signifies that a human author has infused their own intellectual creation into a work in a manner that allows for its precise and objective identification.[65] Initially, EU directives provided a definition of the originality threshold only for

specific technological subject matters, such as computer programs,[66] photographs[67] and databases.[68] Presently, it is evident that the notion of originality at the EU level relies on an autonomous interpretation and adheres to the understanding set forth by the initial directives in the field.

When examining AI Dungeon as an example, determining whether the human authors involved have sufficiently demonstrated the requisite originality in these potentially creative processes poses a considerable challenge. The interaction between players and the game, wherein a storyline is generated based on the player's input and subsequently interpreted by the AI, raises questions regarding originality. Both the CJEU and academic literature have extensively elucidated the concept of originality. It is widely acknowledged in contemporary discourse that the threshold is met when an author makes free and creative authorial choices.[69] Building upon the earlier analysis of authorship, the potential candidates for copyright claims in the final output of these intricate computational creativity works are the user (the player) and the programmer (the developer). However, the user's input often falls short in reflecting the necessary intellectual creation. While the CJEU has suggested that even a short extract could potentially constitute 'the author's own intellectual creation,'[70] it can be argued that the responses generated through the 'do' and 'say' functions in AI Dungeon are often unoriginal (in the copyright sense), as they consist of simplistic and commonplace words that fail to meet the originality threshold. On the other hand, the responses produced through the 'story' function, which provides the player with substantial creative freedom, are more intricate from a copyright standpoint. If the player's input represents their own intellectual creation, that specific response may be deemed original in the context of copyright. However, as Bonadio and Trapova argued, such assessments would necessitate a case-by-case analysis and would only potentially warrant a copyright claim for that particular phrase.[71]

ECLI:EU:C:2019:721, para 29; Case C-833/18 *SI and Brompton Bicycle Ltd v Chedech / Get2Ge* [2020] ECLI:EU:C:2020:461, para 22.

66   Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs [2009] OJ L111/16, art 1(3).

67   Directive 2006/116/EC of the European Parliament and of the Council on the term of protection of copyright and certain related rights [2006] OJ L372/12, art 6.

68   Directive 1996/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases [1996] OJ L77/20, art 3(1).

69   Case C-145/10 *Painer v Standard Verlags GmbH* (n 29); Bonadio and Trapova (n 9).

70   Case C-5/08 *Infopaq* (n 28), para 35.

71   Bonadio and Trapova (n 9).

62   Bonadio and Trapova (n 9).

63   OpenAI, 'ChatGPT: Optimizing Language Models for Dialogue' (*OpenAI*, 30 November 2022). Available at https://openai.com/blog/chatgpt (accessed 20 October 2023).

64   S van Gompel and E Lavik, 'Quality, Merit, Aesthetics and Purpose: An Inquiry into EU Copyright Law's Eschewal of Other Criteria than Originality' (2013) 236 *Revue Internationale du Droit d'Auteur* 100; A Ramalho, 'Originality Redux: An Analysis of the Originality Requirement in AI-Generated Works' [2019] *AIDA* 23.

65   Case C-5/08 *Infopaq* (n 28), para 35; Case C-310/17 *Levola Hengelo BV v Smilde Foods BV* [2018] ECLI:EU:C:2018:899, para 40; Case C-683/17 *Cofemel—Sociedade de Vestuario SA v G-Star Raw CV* [2019]

The assessment becomes even more intricate when considering the 'see' function in AI Dungeon, which enables the protagonist in the storyline to encounter various images, interact with them and advance the narrative. AI Dungeon collaborates with Stable Diffusion, a popular text-to-image AI model that generates images based on prompts provided by the player.[72] Determining the potential copyright authorship of the generated images necessitates a thorough examination of the machine learning models involved. From a proprietary perspective, what is particularly noteworthy is that Stable Diffusion operates as an open-source model, aiming to address complex copyright law issues through a more permissive property model. However, the fundamental question remains whether the final text generated through AI Dungeon, involving the collaborative effort of multiple human authors, satisfies the originality threshold required for copyright protection. Thus far, there have been no court rulings specifically addressing this issue. Nevertheless, it is worth highlighting that, in January 2023, a class-action lawsuit was filed by several artists in the District Court of California against Stability AI (the entity behind Stable Diffusion), as well as other providers of text-to-image generation, namely Midjourney and DeviantArt, Inc.[73] The central claim of the lawsuit revolves around the generative model's capability to create art in the style of a particular artist, using art by that artist included in the training dataset, raising significant copyright concerns.

Moving a step further, the AI applications of virtual reality (VR) and augmented reality (AR) would have copyright implications, in terms of authorship. VR offers an immersive experience to players, whereby the head-mounted display allows players to reside in an interactive virtual world and the specific VR goggles shield the individual from the real physical environment throughout the VR experience.[74] AR, a technology that combines the physical view of the world with virtual elements,[75] would generate a better user experience, according to recent studies,[76] as players enhance their physical and psychological well-being through engagement with game *Pokemon Go*. VR allows players to experience virtual environments, to alter physics in a way that is not possible in the real world and to move their body in innovative ways.[77]

In traditional copyright works, it is rather easy to determine who qualifies as the author of the work. In the digital world, however, the issue of authorship is more difficult to surmise.[78] While in most cases the user has to agree to the Terms of Service or End User Licence Agreement, assigning to the platform/program any rights that might be created,[79] Linded Labs, the creator of the VR game *Second Life*, adopted a different approach, allowing the users to retain rights to all of their creations.[80] That said, one could argue that the tools provided in AR, and consequently the works created, are subject to code restrictions by the programmer.[81] Similarly, Decentraland's Terms of Service provision 12.4, which states that 'all title, ownership and IPRs over the content created by users belong to the users who created said content', reflects a fundamental principle of user-generated content platforms[82] It underscores the platform's commitment to recognizing and upholding the IPRs of its users.

The issue becomes more complicated bearing in mind that game developers have not yet utilized the maximum potential of AI. Tools that enable the production of sophisticated games that can change and respond to player feedback, and in-game characters that evolve if the gamer spends time with them, are closer than one might assume.[83] In a hypothetical scenario, where the video game is entirely AI-generated and is placed in a VR or AR, one wonders who could be considered as the author of the work and as such exercise the exclusive rights, including the act of communication to the public.

Journal of Medical Internet Research 315; C Yang and D Liu, 'Motives Matter: Motives for Playing Pokémon Go and Implications for WellBeing' (2017) 20 *Cyberpsychology, Behavior, and Social Networking* 52.

77   X Tong and others, 'Exploring Body Gestures as Natural User Interface for Flying in a Virtual Reality Game with Kinect' in Proceedings of the 2016 IEEE International Workshop on Mixed Reality Art, MRA 2016 (Greenville, SC, USA, 19 March 2016).

78   M Afoaku, 'The Reality of Augmented Reality and Copyright Law' (2017) 15(2) Northwestern Journal of Technology and Intellectual Property 111.

79   TD Marcus, 'Fostering Creativity in Virtual Worlds: Easing the Restrictiveness of Copyright for User-Created Content' (2008) 52 *New York Law School Law Review* 67.

80   Linden Lab 'Terms of Service' Available at www.lindenlab.com/tos (accessed 4 July 2023).

81   Afoaku (n 78).

82   Decentraland 'Terms of Use 12.4' Available at https://decentraland.org/terms/#12-proprietary-rights (accessed 20 October 2023).

83   N Statt 'How Artificial Intelligence will Revolutionise the Way Video Games Are Developed and Played' (*The Verge,* 6 March 2019). Available at www.theverge.com/2019/3/6/18222203/video-game-ai-future-procedural-generation-deep-learning (accessed 4 July 2023).

72   'Latitude Blog: High-Quality Image Generation Is Now on AI Dungeon!' (19 August 2022). Available at https://latitude.io/blog/high-quality-image-generation-is-coming-to-ai-dungeon (accessed 20 May 2023).

73   See the class-action complaint file here: Available at https://stablediffusionlitigation.com/pdf/00201/1-1-stable-diffusion-complaint.pdf (accessed 20 May 2023).

74   J Roettl and R Terlutter, 'The Same Video Game in 2D, 3D or Virtual Reality – How Does Technology Impact Game Evaluation and Brand Placements?' (2018) 13 *PLoS ONE* 1.

75   The most famous AR game is *Pokémon Go*, where the game combines the physical view of the world (such as location, map and streets) with virtual elements (such as animated creatures).

76   Lou (n 12); See also T Althoff, RW White and E Horvitz, 'Influence of Pokémon Go on Physical Activity: Study and Implications' (2016) 18

Taking as an example the popular AR game *Pokémon Go*, which combines the physical view of the world (such as location, map and streets) with virtual elements (such as animated creatures), the technology could build upon this example and advance the gamers' experience by creating a computer-generated game in which the virtual elements are generated from the inputs of the environment itself, thus having minimal or zero human intervention. In addition, taking into consideration the study conducted by Tong and others, which explored body gestures as a 'natural user interface' for flying in a VR game, it would be hard to argue that a work created by the gamer would lack originality or intellectual creation.[84]

At present, AI technology is not completely autonomous; human intervention is required for writing the algorithm, choosing and collating data, reviewing output and revising the model.[85] The 2019 World Congress of the International Association for the Protection of Intellectual Property, known as AIPPI (Association Internationale pour la Protection de la Propriété Intellectuelle), moved a step further by discussing the controversial issue of introducing a new right to protect AI-generated works where an AI-generated work would fail to be protected under existing copyright or related rights. Although a proposal was made for a new *sui generis* right, the AIPPI's resolution mentioned that since AI is still developing, further work is required in order to understand the need for a new right to protect AI-generated works.[86]

The far fetching and hypothetical—based on today's technological development—scenarios used above necessitate the determination of authorship of AI-generated content.

4. Conclusion

Determining the authorship of AI-generated works presents a multifaceted challenge. Among the advancements, AI-generated video games pose additional questions and challenges in terms of authorship and subsequent exploitation of the work. Who will be the author of an AI-generated video game? Who subsequently will have the exclusive right to communicate the work to the public? Traditional copyright principles, which attribute authorship to human creators who demonstrate creativity and skill, often clash with AI-generated works that lack a discernible human author. The article discussed that if the work is repetitive and predictable, then the programmer of the AI should be the author of the work. The arguments in favour of the programmer being so identified emphasize the intellectual conception of the output, or in other words that the programmer has imagined it. Proponents of this approach claim that 'users' merely press a button, which does not employ any intellectual creativity. This argument sees the programmer as the 'author of the authors'.

The user's input was also taken into consideration. The arguments in favour of the user as sole author focus on the element of creativity that the user puts into the work, regarding the machine as a mere tool. However, where the user's input is a simple command, such as 'compose', the user should not be the author. In the event that the output is not repetitive or predictable and the user's contribution was minimal, then it has been suggested that the AI itself may be the author. The essence of AI-generated content lies in its ability to process and generate output autonomously, often relying on algorithms and data. This intrinsic lack of creative agency in the human sense complicates the conventional attribution of authorship. Consequently, a debate has arisen regarding whether AI should be recognized as a co-author alongside its human operator, reflecting the collaborative nature of content generation. The AI itself has been suggested to be the author, where the output is not predictable by the programmer, there is no user, and the AI has the discretion to decide whether it will produce works in the future. In other words, the more independent the AI becomes, the harder it is to identify a human being responsible for the arrangements.

Chew suggests that placing AI-generated inventions immediately into the public domain is the optimal solution.[87] The public domain refers to creative works or innovations that are not protected by IP laws, making them accessible to the public at large rather than any individual creator. This approach would address legal ambiguities regarding authorship and rights allocation for autonomous AI-generated works, promoting fair access to a vast volume of creative content and facilitating secondary markets. It would also encourage the greater adoption of AI-generated works, driving economic growth and preserving human creativity. As the intersection of AI and IP law continues to evolve, legal scholars, courts and policymakers seek to establish coherent frameworks for authorship attribution and ownership in AI-generated creative endeavours.

84   Tong and others (n 77).

85   H Bosher and others 'WIPO Impact on Artificial Intelligence on IP Policy Response from Brunel University London, Law School and Centre for Artificial Intelligence' (2020). Available at www.wipo.int/export/sites/www/about-ip/en/artificial_intelligence/call_for_comments/pdf/org_brunel.pdf (accessed 7 October 2023).

86   AIPPI 2019 World Congress 'Copyright in Artificially Generated Works – Resolution' (London, 18 September 2019). Available at https://aippi.org/wpcontent/uploads/2020/05/Resolution_Copyright_in_artificially_generated_works_English.pdf (accessed 4 July 2023).

87   E Chew 'Algorithmic Creativity: How Should the UK Copyright Regime Accommodate Autonomous AI-generated Works?' (*LSE Law Review Blog*, 24 March 2023). Available at https://blog.lselawreview.com/2023/03/algorithmic-creativity-uk-copyright-regime-accommodate-autonomous-ai-generated-works#23 (accessed 7 October 2023).