ARTIFICIAL INTELLIGENCE AS PRODUCER AND CONSUMER OF COPYRIGHT WORKS: EVALUATING THE CONSEQUENCES OF ALGORITHMIC CREATIVITY

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INTRODUCTION

Artificial intelligence (AI) has recently been attracting a great deal of interest and attention. There is no doubt that, as has often happened in the past during previous waves of technological advances, AI platforms - and especially, machine learning - have brought with them new opportunities as well as challenges. Machine learning is an AI application enabling programs to automatically learn and progress from experience. Its main feature is accessing data and often using it for the purpose of creating outputs, including music, literature, movies and art. Amounts of data are observed and analysed by the machine, which enables the latter to learn and then make creative decisions leading to final outputs that, as precise works of art, are often not foreseeable by the people who developed and started the initial program. Such a process is characterised by the absence of substantial human intervention or assistance after the program is operated, and by the use of algorithms – namely a sequence of instructions aimed at solving a problem or performing a computation.[1] It can be deemed 'algorithmic creativity'; or the way by which AI/machines create new works.

Consider the example of Jukedeck - a program which employs machine learning to train its system in the rules of music theory, and composes music via an algorithm.[2] Customers can set parameters, such as music genre (e.g., jazz, blues, rock, ambient, chillout, etc.), main instruments, length of the tune, and speed (e.g., up-tempo, low-tempo). The track is then composed in around 20 seconds and made available to customers as an MP3 file.[3] The Artificial Intelligence Virtual Artist (AIVA) is another example of an AI music composer.[4] In June 2016 AIVA became the first virtual artist to be recognised by an author's right society when it was

[1] Hereinafter in the context of this article we will use interchangeably the terms 'AI', 'machine', 'robot', 'computer', 'program' and 'algorithm' when referring to technologies capable of producing outputs without substantial human involvement.
[2] Emma Featherstone, Introducing the next generation of music makers, The Guardian, 29 August 2017, available at https://www.theguardian.com/small-business-network/2017/aug/29/computer-write-music-jukedeck-artificial-intelligence.
[3] Ibid.
[4] See AIVA's website at www.aiva.ai.

registered as composer by French collecting society SACEM.[5] The use of programs like Jukedeck and AIVA is on the rise, pushing the boundaries of music creation.

In addition to music AI can produce literature, including poems, novels and new articles.[6] Take Brutus, a program that writes short stories, which are often intriguing, have a hint of mystery and are written in correct English prose;[7] or the Cybernetic Poet, software which allows a computer to write poetry by adopting style and vocabularies of human poets[8] (this technology is also protected by a US patent).[9] Technology developed by companies such as Automated Insights[10] and Narrative Science[11] can be used to create automated narratives with no substantial human intervention; the former company provides natural language software, transforming data into narratives that can be read and appreciated, while the latter helps businesses to do internal and external reporting – e.g. high-volume reporting workflows by using (again) natural language generation (an activity which is usually time-consuming when it is undertaken by human beings).

Visual art is also increasingly being created by AI. Examples abound: AARON, for instance, is a computer program produced by Professor Harold Cohen that generates artistic images by using real paint (not pixels) on actual canvases (he initially created the program in the 70s and then developed it over time);[12] Deep Dream is another popular computer vision program (created by Google) that employs a convolutional neural network to find and enhance patterns in images through algorithms, and then turns the images fed into the system into dream-like

[5] Bartu Kaleagasi, A New AI Can Write Music as Well as a Human Composer - The future of art hangs in the balance, 9 March 2017, available at www.futurism.com/a-new-ai-can-write-music-as-well-as-a-human-composer.

[6] Technologies that are capable of composing music can also be patented inventions. One such example is international patent WO/2008/077128, owned by David Cope, protecting an invention entitled 'Recombinant music composition algorithm and method of using the same'. The abstract of the invention tells us that: 'The present invention provides a retrograde recombinant composition algorithm that creates new musical compositions based on existing musical compositions that are preferably written in software and is suitable for implementation in electro-mechanical and electronic devices that generate musical works based on existing bodies of music. The retrograde approach to recomposition according to the present invention provides a highly simplified code that executes at a high speed, and accordingly a reduced need for computational resources.' See the WIPO webpage at https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2008077128.

[7] Selmer Bringsjord and David Ferrucci, Artificial Intelligence and Literary Creativity - Inside the Mind of BRUTUS, a Storytelling Machine (2000) Hillsdale NJ: Lawrence Erlbaum Associates.

[8] See the webpage http://www.kurzweilcyberart.com/poetry/rkcp_poetry_samples.php

[9] See US patent No 6,647,395: 'A method of generating a poet personality including reading poems, each of the poems containing text, generating analysis models, each of the analysis models representing one of poems and storing the analysis models in a personality data structure. The personality data structure further includes weights, each of the weights associated with each of the analysis models. The weights include integer values.'

[10] See the webpage https://automatedinsights.com.

[11] See the webpage https://narrativescience.com.

[12] Harold Cohen, The further exploits of AARON, Painter, 22 July 1995, available at https://web.stanford.edu/group/SHR/4-2/text/cohen.html.

hallucinogenic creations.[13] Perhaps the best known example is the 'Next Rembrandt' project - the generation of a new 3D printed painting produced from data scanned from the famous Dutch maestro's body of artworks.[14] The project attracted media interest over the fact that the new portrait in the style of Rembrandt was completed using deep learning algorithms and facial recognition techniques. There is little doubt that such paintings - made by AI and 'smart' robots - are gaining more and more popular attention. Algorithmically created artworks have recently been exhibited as part of a solo exhibition by a robot artist;[15] such works of art have even been sold at auction for significant amounts of money.[16]

There is no doubt, therefore, that AI technologies are capable of creating tangible and intangible outputs. If such musical, literary and artistic expressions were created by humans, no one would object to them being considered as copyright works. AI-created works are certainly capable of captivating an audience and stimulating emotions in a similar fashion to works of music, literature or art produced by human beings;[17] some AI-created works have even been accorded an economic value in the art market. Yet their copyright status is doubtful in several jurisdictions precisely because these outputs are generated in large part (and sometimes almost entirely) by machines. The human(s) who triggered the automated process that lead to the creation of the expression often have no idea how the ultimate work will look or sound. This 'unforeseeability' seems to break the causal link between humans who create or use these machines, and the final output produced by the latter.[18] In copyright theory property rights are justified in large part by e.g. the Lockean argument that the human has laboured to create the work; or in Kantian terms, by emphasising that the work arose from the personality of the

[13] Alex Rayner, Can Google's Deep Dream become an art machine? 28 March 2016, available at https://www.theguardian.com/artanddesign/2016/mar/28/google-deep-dream-art.

[14] Chris Baraniuk, Computer Paints 'New Rembrandt' after Old Works Analysis, 6 April 2016, available at https://www.bbc.com/news/technology-35977315.

[15] This is the case of Ai-Da 'the world's first ultra-realistic AI humanoid robot artist' who had her first solo exhibition of eight drawings, 20 paintings, four sculptures and two video works in Oxford in June 2019: see Matthew Stock, Ai-Da, The Humanoid Robot Artist Gears up for First Solo Exhibition, 5 June 2019, available at https://www.reuters.com/article/us-tech-robot-artist/ai-da-the-humanoid-robot-artist-gears-up-for-first-solo-exhibition-idUSKCN1T6215.

[16] See the $432,500 sale by the auction house Christie's in October 2018 of the AI-created portrait in a gilt frame *Portrait of Edmond Belamy* (see Christie webpage at https://www.christies.com/features/A-collaboration-between-two-artists-one-human-one-a-machine-9332-1.aspx).

[17] Jared Vasconcellos Grubow, O.K. Computer: The Devolution of Human Creativity and Granting Musical Copyrights to Artificially Intelligent Joint Authors (2018) 40/1 Cardozo Law Review, pp. 409-410 (noting, with specific reference to music, that 'Al learns the notes, rhythms, and other musical elements of each work, it assigns weights to them until it can accurately predict subsequent notes and rhythms within a genre. Each note output is a subsequent input for generating a musical phrase. The weights, linked to specific neurons and layers of the neural network, resemble human emotions when we hear music we like – chemical interaction between two neurons fire, triggering the release of pleasant-feeling hormones. It is algorithmic emotion').

[18] Pamela Samuelson. Allocating Ownership Rights in Computer-Generated Works (1985-1986) 47 U. Pitt. L. Review, p. 1208; Daniel Gervais, The Machine as Author (2019) 105 Iowa Law Review, pp. 19-20.

human author.[19] Such theories do not fit neatly with a non-human author.

Thus, as machines have learned to mimic human creativity, the copyright world has accordingly entered into AI-driven unchartered territory. We aim here to navigate through this territory, providing a road-map of what the legal repercussions of AI are, and guidance on what routes the law should take in the future.[20] Given the wide-ranging nature of the legal and policy issues raised in this article, we take into account the laws of several different jurisdictions, especially the US, the UK and the European Union (EU).

Is an AI-created work protected by copyright? Should it be? Who would be viewed as the author? Who should own such a work? The questions are the focus of the first part of this article: 'AI as Producer'. In the second part 'AI as Consumer' our analysis shifts to the questions of whether and to what extent the use of data fed into the system, for example to train the algorithms, may amount to copyright infringement, or may in certain circumstances be exempted under fair use, fair dealing or similar doctrines. In the third part we consider possible legal regimes for dealing with machine produced works including alternatives to copyright, such as a public domain scenario and a *sui generis* system. Finally, we provide our conclusions.

ARTIFICIAL INTELLIGENCE AS PRODUCER

By any rational measure AI systems can be said to produce works creatively. Moreover, they do so in an accurate, logical and independent way, with the final output often consisting of something unpredictable to the humans who programmed the AI platform in the first place (as well as the user(s) of the AI).[21] As with much content produced by humans, it is often the case that a key element of the creative process in AI-enabled works is based on randomness.[22] So,

[19] Martin Kretschmer and Friedemann Kawohl, The History and Philosophy of Copyright, in Simon Frith and Lee Marshall (ed) Music and Copyright (2004) Edinburgh: Edinburgh University Press, pp. 21-53. See also Anne Barron. Kant, Copyright and Communicative Freedom (2012) 31 Law and Philosophy pp. 1-48.

[20] Annemarie Bridy, Coding Creativity: Copyright and the Artificially Intelligent Author (2012) Stanford Technology Law Review, p.69-70 (noting that 'the copyright system is now in a digitally induced crisis').

[21] Shlomit Yanisky-Ravid, Generating Rembrandt: Artificial Intelligence, Copyright, and Accountability in the 3A Era – The Human-Like Authors are Already Here – A New Model (2017) Mich. St. Law Review, pp. 670 and 675.

[22] It has been argued that the fact that AI creative processes are based on randomness and unpredictability should not be considered as a bar to copyright. Indeed, such features are also shared by creative processes unleashed by human beings: see Samantha Fink Hedrick, I Think, Therefore I Create: Claiming Copyright in the Outputs of Algorithms (2019) 8 NYU J. Intell. Prop. & Ent. L., p. 365 (also noting that 'had randomness or unpredictability been a bar to creativity, Jackson Pollock would have been unable to claim copyright in any of his works, as he could not have known precisely where each drop of paint would fall on the canvas, or the shape that every splatter would take upon contact. To claim copyright, control over a work must be sufficient, but not complete'. In the same article (p. 343) Hedrick also argued that knowledge of the intricacies of deep learning is not conclusive, as a programmer can still maintain control even without a complete understanding of its operations, in the very same

is the final output generated by a machine protected by copyright – and, if so, who would be seen as its author (and owner)?

1. This is not a new question

The issue of whether computational creativity can be protected by copyright is not actually a new one, at least in the US. As far back as 1965 the US Register of Copyrights reported concerns to Congress about the rise of computer technology and wondered if and where the line between human authorship and computer production should be drawn.[23] More than a decade later, in 1978, the US National Commission on New Technological Uses of Copyrighted Works (CONTU Commission) reported on the issue and concluded that computers used to produce works were just 'inert tools of creation'. The CONTU Commission remarked:

- "[t]his discussion may have stemmed from a concern that computers either had or were likely to soon achieve powers that would enable them independently to create works that, although similar to other copyrightable works, would not or should not be copyrightable because they had no human author. The development of this capacity for 'artificial intelligence' has not yet come to pass, and, indeed, it has been suggested that ... such development is *too speculative* to consider at this time." (emphasis added)[24]

What the CONTU Commission considered too speculative in late 1970s became commonplace only a few years later. Advances in computing technology prompted the US Congress Office of Technology Assessment (OTA) to issue a report in 1986 arguing that CONTU's prior approach had been too simplistic and that computer programs were more than mere 'inert tools of creation'.[25] Uncertainty still reigned, however, as in the same report OTA recognised that 'we know that these works would be copyrightable if they were done by people, but we don't know what to do with them if they're done by computers'.[26]

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way a young and unexperienced photographer who chooses a setting on her camera without understanding what it does or how it works, will still be able to use those settings to manipulate the output; see also Jared Vasconcellos Grubow, above note 17, pp. 409-410 (noting, with specific reference to music, that the unpredictability of the final output "serves as a proxy for creativity").

[23] U.S. Copyright Office, 68th Annual Report of the Register of Copyrights 5 (1965).

[24] National Commission on New Technological Uses of Copyrighted Works (CONTU Commission) – Final Report 44 (1978); see also Ithiel De Sola Pool, The Culture of Electronic Print (1982) 111(4) Deadalus, p. 29 (noting that 'the idea that a machine is capable of intellectual labor is beyond the scope of the copyright statute').

[25] US Office of Technology Assessment, Intellectual Property Rights in an Age of Electronics and Information 69 (1986).

[26] Ibid. See also Yanisky-Ravid, note 21, p. 662-663.

The developments in computational - and more recently artificial intelligence and machine learning - technologies in the subsequent decades have made the issues related to copyright in works created by machines more pressing. Academic interest in this topic has soared.[27] Many of these academic scholars are interested in the question we now turn to: who can be an author?

[27] Darin Glasser, Copyrights in Computer-Generated Works: Whom, If Anyone, Do We Reward? (2001) 1 Duke L. & Tech. Rev.; Charles Cronin, Virtual Music Scores, Copyright and the Promotion of a Marginalized Technology (2004) 28 Colum. J.L. & Arts; William Ralston, Copyright in Computer-Composed Music: HAL Meets Handel (2005) 52 J. Copyright Soc'y U.S.A.; Mark Perry and Thomas Margoni, From Music Tracks to Google Maps: Who Owns Computer-Generated Works? (2010) Computer Law & Security Review; Jani McCutcheon, The Vanishing Author in Computer-Generated Works: A Critical Analysis of Recent Australian Case Law (2013) Melbourne University Law Review; Emily Dorotheou, Reap the Benefits and Avoid the Legal Uncertainty: Who Owns the Creations of Artificial. Intelligence? (2015) 21 Computer and Telecommunications Law Review; Burkhard Schafer, Davis Komuves, Jesus Niebla Zatarain and Laurence Diver, A Fourth Law of Robotics? Copyright and the Law and Ethics of Machine Co-Production (2015) 23/3 Artificial Intelligence and Law; Robert C. Denicola, Ex Machina: Copyright Protection for Computer-Generated Works (2016) 69 Rutgers L. Rev.; Madeleine de Cock Buning, 'Autonomous Intelligent Systems as Creative Agents under the EU framework for Intellectual Property' (2016) European Journal of Risk Regulation; James Grimmelmann, There's No Such Thing as a Computer-Authored Work (2016) 39 Colum. J. L. & Arts; Annemarie Bridy, The Evolution of Authorship: Work Made by Code (2016) 39 Colum. J. L. & Arts; Bruce Boyden, Emergent Works (2016) 39 Colum. J. L. & Arts; Ryan Abbott, Artificial intelligence, Big Data and Intellectual Property: Protecting Computer-Generated Works in the United Kingdom, in Tanya Aplin (ed), Research Handbook on Intellectual Property and Digital Technologies (2017) Cheltenham: Edward Elgar; Ana Ramalho, Will Robots Rule the (Artistic) World? A Proposed Model for the Legal Status of Creations by Artificial Intelligence Systems (2017) 21 Journal of Internet Law; Benjamin Sobel, Artificial Intelligence's Fair Use Crisis (2017) 41 Colum. J.L. & Arts; Kalin Hristov, Artificial Intelligence and the Copyright Dilemma (2016) 57/3 IDEA: The IP Law Review; Robert Yu, The Machine Author: What Level of Copyright Protection Is Appropriate for Fully Independent Computer-Generated Works? (2017) 165 U. Pa. L. Rev.; Andres Guadamuz, Do Androids Dream of Electric Copyright? Comparative Analysis of Originality in Artificial Intelligence Generated Works (2017) 2 Intellectual Property Quarterly; Amir Khoury, Intellectual Property Rights for Hubots: On the Legal Implications of Human-like Robots as Innovators and Creators (2016-2017) 35 Cardozo Arts & Ent. L.J.; Enrico Bonadio, Luke McDonagh and Christopher Arvidsson, Intellectual Property Aspects of Robotics (2018) 9 European Journal of Risk Regulation; Jane Ginsburg and Luke Budiardjo, Authors and Machines (2018) 34 Berkeley Technology Law Journal; Nina Brown, Artificial Authors: A Case for Copyright in Computer-Generated Works (2018) 20 The Columbia Science & Technology Law Review; Daniel Schönberger, Deep Copyright: UP- and Downstream Questions Related to Artificial Intelligence (AI), in Jacques De Werra (ed.), Droit d'auteur 4.0 / Copyright 4.0 (2018) Geneva / Zurich: Schulthess Editions Romandes; Shlomit Yanisky-Ravid and Luis Velez-Hernandez, Copyrightability of Artworks Produced by Creative Robots and Originality: The Formality-Objective Model (2018) 19 Minn. J.L. Sci. & Tech.; Garrett Huson, I, Copyright (2018) 35 Santa Clara High Technology Law Journal; Daryl Lim, AI & IP: Innovation & Creativity in an Age of Accelerated Change (2019) 52 Akron Law Review; Victor M. Palace, What If Artificial Intelligence Wrote This: Artificial Intelligence and Copyright Law (2019) 71 Fla. L. Rev.; Tanya Aplin and Giulia Pasqualetto, Artificial Intelligence and Copyright Protection, in Rosa Maria Ballardini, Petri Kuoppamäki and Olli Pitkänen (eds) Regulating Industrial Internet Through IPR, Data Protection and Competition Law (2019) The Hague: Kluwer International; Tim Dornis, Artificial Creativity: Emergent Works and the Void in Current IP Doctrine (2020) 22 Yale Journal of Law & Technology. For a recent literature review on the subject, see Technical Report by the Joint Research Centre (JRC) of the European Commission, authored by Maria Iglesias, Sharon Shamuilia and Amanda Anderberg, Intellectual Property and Artificial Intelligence (2020). For key papers from the 1960s-1990s: see Karl F. Milde Jr., Can a Computer Be an 'Author' or an 'Inventor'? (1969) 51 J. PAT; Timothy L. Butler, Can a Computer be an Author - Copyright Aspects of Artificial Intelligence (1982) 4 Hastings Comm. & Ent. L.J.; Stephen Hewitt, Protection of Works Created by the Use of Computers (1983) 133 New L.J.; Dan Rosen, A Common Law for the Ages of Intellectual Property (1984) 38 U. Miami L. Rev.; Evan H. Farr, Copyrightability of Computer—created works (1989) 15 RUCTLJ; Robert J. Hart, Author's Own Intellectual Creation – Computer Generated Works (1993) 9 Computer Law and Security Review; Arthur R. Miller, Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU? (1993) 5 Harvard Law Review; Tal Vigderson, Hamlet II: The Sequel: The Rights of Authors vs. Computer-Generated Read-Alike Works (1994) 28 Loy. L.A. L. Rev.; Ralph Clifford, Intellectual Property in the Era of the Creative Computer Program (1997); Andrew J. Yu, From Video Games to Artificial Intelligence: Assigning Copyright Ownership to Works Generated by Increasingly Sophisticated Computer Programs (1997) 25 AIPLA Q. J.

2. The authorship conundrum

The question of 'who is the author' of the final machine generated output(s) is crucial because under most copyright regimes around the world the author of the work is also the first owner of the copyright. Ownership gives the author the right to sell, license or otherwise control the work. Traditionally, authors have been human and copyright's rationales for recognising, rewarding and incentivising creativity through property have human authors in mind. By contrast, AI and machine learning technologies enable users (who might otherwise work as authors and artists in their own right) to turn over control to a system that is sufficiently self-contained enough in key-decision making abilities to operate autonomously.[28] Therefore, one could argue that automation in this field - in the form of a machine takeover of the creative process from humans - is antithetical to the concept of authorship underpinned by copyright.

The requirement for authors/artists to be human is a assumption common in many copyright regimes.[29] This principle is enshrined in international treaties such as the Universal Declaration of Human Rights and the International Covenant on Economic, Social and Cultural Rights. The former states that 'everyone' has the right to benefit from the protection of the moral and material interests resulting from their works (Article 27 UDHR and Article 15 ICESCR). The use of the noun 'everyone' clearly suggests a necessary human element. Furthermore, several national copyright laws limit authorship to natural persons. Spanish law, for example, provides

[28] Bridy, note 27, p.395. That machines can be truly creative and autonomous is not unanimously accepted. Several commentators stress that human beings must still be considered in control of the whole AI generative process; see for example Ginsburg and Budiardjo, note 25, pp. 344, 401-405 (noting that '[n]o machine is itself a source of creativity' and that every action of a machine is 'the product of the precise articulation of commands by a human programmer or machine operator'. These authors believe that today's generative machines are at best 'faithful' and 'obedient' agents of the humans who interact with them, and that execute specific instructions from them. A similar view is voiced by Hedrick, note 22, arguing that 'there are human programmers and users who write the algorithm's code, set the objective functions and other parameters of the algorithm, and decide whether the algorithm is creating the desired outputs or whether it ought to be tweaked. These humans are masterminding the creative process; even complex Al models are simply following the humans' commands (or at least creative guidelines, criteria, and rules)' (p. 332). Hedrick also argues that '[e]ven when an algorithm generates something H-creative ('historically creative' i.e., never before created by humans), such creativity is the result of the instructions and capabilities programmed by its creator and is therefore dictated by the (creative) choices of the programmer or user' (p. 339). She further notes that '[the] programmer or user therefore 'superintends' and 'masterminds' the work of the algorithm, providing it with parameters that guide its functionality and data that determines its trajectory' (p. 353); and that 'algorithms can be programmed to exhibit apparent creativity as the result of built-in randomness and other rules, including commands to break certain rules in order to create more unique works. However, that creativity is still the result of those rules and of the creative choices made by the programmer and the user' (p. 359)..

[29] Sam Ricketson, People or Machines: The Berne Convention and the Changing Concept of Authorship (1991-1992) 16 COLUM. J. L. & ARTS, pp. 8 and 11 (adding that '[t]here must still be evident some human contribution to the form of the work for which protection is claimed. To put it crudely, the work must not be generated by a machine or be the result of some organized industrial undertaking wherein it is impossible to identify an individual human creator or creators').

that the author is the natural person creating the work;[30] French law suggests that only a natural person can be the author;[31] and German law provides that copyright protects the author in his or her intellectual/personal relationship to the work.[32] Likewise, although there is no specific human authorship requirement in the US Copyright Act,[33] in the Compendium of its practices the US Copyright Office emphasises the importance of the human element in the creative process. The US Office only registers an original work of authorship '…provided that the work was created by a human being'.[34]

The US Copyright Office has been even clearer when it comes to works generated by new technologies, noting 'the Office will not register works produced by a machine or mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author'.[35] Despite these provisions not having a binding effect,[36] they nonetheless demonstrate that the US copyright system takes an unfavourable view towards protecting AI- and machine created works via copyright. This attitude has been visible since the early days of computer technological advance.

When in 1956 US mathematicians Martin Klein and Douglas Bolitho tried to register the computer-generated song 'Push Button Bertha' the US Copyright Office refused the registration, adding that no one had ever registered music created by a machine;[37] and in 1964 the same office refused to register a design for a tile floor because it had been produced by a machine using random geometric patterns, asserting that the design did not constitute the 'writing of an author'.[38] A similar outcome was reached more recently by the Australian courts. In *Acohs Pty Ltd v Ucorp Pty Ltd* the Federal Court of Australia considered that the underlying HTML code for information sheets generated by a computer program did not have any author, and therefore could not be protected by copyright.[39]

[30] See Preambulo, Ley 22/11 sobre la Propiedad Intelectual de 1987: 'los derechos que corresponden al autor, que es quien realiza la tarea puramente humana y personal de creacion de la obra y que, por lo mismo, constituyen el nucleo esencial del objeto de la presente Ley'.
[31] Article L112-1 of the French Code de la Propriete' Intellectuelle of the French Code of intellectual property defines copyrightable subject matter as 'oeuvres de l'esprit'.
[32] Article 11 of the German Copyright Act German Copyright Act (Urheberrechtsgesetz, UrhG).
[33] This was confirmed by a dicta in the above mentioned *Urantia Foundation v Maaherra*, 895 F. Supp. 1337 (D. Ariz. 1995) at 957 (dealing with copyright in a work supposedly created by celestial voices).
[34] Compendium of U.S. Copyright Office Practices § 101 (3d ed. 2017), 306.
[35] Ibid., 313.
[36] The Compendium of US Copyright Office Practices is a manual published by the Office, used by staff as a guide to the Office's policies and procedures.
[37] See Bridy, note 27, p. 395-397.
[38] US Copyright Office, Register of Copyright, 67th Annual Report of the Register of Copyrights (1964) 7-8; see also Hedrick, above note 22, p. 365.
[39] *Acohs Pty Ltd v Ucorp Pty Ltd* [2012] FCAFC 16.

In the US, the claims of 'animal authorship' share some similarities with the claims of AI authorship. In a widely reported case - *Naruto v. Slater*[40] - involving copyright in a 'monkey selfie' and the enforceability of the alleged copyright to prevent the photograph from being exploited, a Californian court rejected the argument brought by the plaintiff, the animal rights' organisation People for the Ethical Treatment of Animals (PETA), that US copyright law does not prohibit an animal from being an author. The court held that while animals had constitutional standing, they lacked equivalent standing to claim copyright infringement of e.g. a photograph. A similar line of argument was adopted by judges in both the US and UK in a string of cases focusing on who the author is in situations where 'celestial voices' may have played a role in the creation of the work (cases involving so-called *psycography*, namely automatic writing used for spiritualistic purposes and channelled from the spirit world). In these cases, when faced with claims of spiritual authorship, the courts concluded that only humans can own the copyright.[41]

Under European Union law there is no explicit authorship requirement; the concept of authorship in EU copyright law is linked to the originality requirement. In *Infopaq* the latter has been interpreted by the Court of Justice of the European Union (CJEU) as requiring the work to be the 'author's own intellectual creation'.[42] In *Eva-Maria Painer* the CJEU clarified that an intellectual creation is an author's own if it reflects her personality.[43] This would be the case, the court added, if the author were able to express free and creative choices i.e. a 'personal touch'. This suggests that the originality requirement involves some degree of human authorship. This point is reinforced by a remark by Advocate General Trstenjak in his Opinion in *Eva-Maria Painer* - *'*... only human creations are ... protected'.[44] This statement does not bode well for the proposition that works created by a machine should be considered original and therefore copyright; rather the view of AG Trstenjak confirms the personal and anthropocentric nature of the EU copyright regime – a characteristic embedded within the civil law countries of continental Europe that have historically focused on the *droit d'auteur* approach to authorship as emblematic of human creativity and personality.

[40] *Naruto v. Slater*, 2018 U.S. App. LEXIS 10129 (9th Cir. Cal., Apr. 23, 2018).
[41] *Cummins v Bond*, 1 Ch. 167 (1927); *Oliver v Saint Germain Foundation*, 41 F. Supp. 296 (S.D. Cal. 1941); *Urantia Foundation v Burton*, No K 75-255 CA 4, 1980; *Urantia Foundation v Maaherra*, 895 F. Supp. 1337 (D. Ariz. 1995); *Penguin Books, Inc. v. New Christian Church of Full Endeavour*, No 96 CIV. 4126.
[42] Case C-5/08 Infopaq International A/S v Danske Dagblades Forening, para 35.
[43] Case C-145/10 Eva-Maria Painer v Standard Verlags GmbH and Others, para 88.
[44] Case C-145/10 Eva-Maria Painer v Standard VerlagsGmbH, Opinion of Advocate General Trsteniak, 12 April 2011, para 121.

In the European context what would be required in order to assess AI-produced works as 'original' is an objective interpretation of the originality requirement (which clearly does not fit into the current EU *acquis* on this test). Put simply, it would require looking at the final output *per se* – regardless of whether there has been involvement of a human being in its generation. In a recent case in Shenzen, a Chinese Court that considered a series of AI-produced news articles to be copyright appears to have taken this very approach.[45] Thus, the objective interpretation undertaken by a judge, considering the field of art and public to which it is addressed, as well as its closeness to pre-existing works, would be the crucial factors for the purpose of determining originality. This would evidently shift the focus from a subjective intention of the human author (which Justine Pila has argued in favour of[46] and cases such as *Lucasfilm* align with,[47] but is obviously absent in circumstances where robots create independently/autonomously) towards the objective opinion of viewers or listeners of the work.[48] Nevertheless, as mentioned, the current EU originality requirement actually requires a human touch in the generative process, which inevitably makes any objective interpretation of this test difficult if not impossible.

3. How to face the authorship issue: the 'work made for hire' and 'adaptation' approaches

A novel way to deal with the authorship issue may be to consider outputs created by AI as equivalent to works produced by employees in the course of their employment (or by independent contractors). In these circumstances (for example, under US law) the copyright remains with the employer or the person who has commissioned the creation, who are deemed authors of the final output. This is known in US law as the 'work made for hire' doctrine,[49] namely a legal fiction that implements a policy decision to sidestep the real author to attribute

[45] See Zhang Yangfei, Court Rules AI-Written Article Has Copyright, China Daily of 9 January 2020, available at https://www.chinadaily.com.cn/a/202001/09/WS5e16621fa310cf3e3558351f.html.
[46] Justine Pila, An Intentional View of the Copyright Work (2008) 71/4 The Modern Law Review. See also Daniela Simone, Copyright and Collective Authorship: Locating the Authors of Collaborative Work (Cambridge: Cambridge University Press, 2019) and Luke McDonagh, Rearranging the Roles of the Performer and Composer in the Music Industry – the Potential Significance of *Fisher v Brooker*' (2012) 1 Intellectual Property Quarterly.
[47] *Lucasfilm Limited and others v Ainsworth and another* [2011] UKSC 39.
[48] Such point has been raised in the context of the US copyright system by Yaniski-Ravid and Velez-Hernandez, note 27, pp. 33-35, 41-42 (also noting that 'adopting an objective perspective of originality would enable judges and juries to evaluate works made not only by humans, who act with intention, but also works created by creative robots, for which it remains difficult to understand the concept of consciousness and intention. … In other words, we claim that the creator's subjective intention to make a derivative work is irrelevant. … [T]he objective criterion is inevitable for Internet or computer-generated works as there are no subjective feelings involved').
[49] See 17 U.S.C. § 101 (including the definition of 'work made for hire').

copyright to someone else.[50] Put it differently, this doctrine confirms that a person or entity that has not played an active role in the generation of the output is treated as the author of a work actually produced by another person (i.e. a human employee or contractor).[51] If we extend this doctrine to output produced by AI or robots,[52] the author of the works would be the person that merely triggered the creative process (without any substantial creative role in shaping the final work).

The extension of the 'work made for hire' doctrine to algorithmic creations is not unproblematic. A machine cannot be compared to an employee, as the former is not given a salary or paid annual leave (and cannot join a trade union).[53] Human employees have legal rights and duties under agreements entered into with their employers. The machine 'employee', on the other hand, cannot be considered as entering into an employment agreement, nor is a computer capable of asserting legal rights.[54] The fact that programmers or users of a machine 'employ' the latter for creative purposes – the argument goes - does not make the robot an 'employee' capable of triggering the 'work for hire' legal fiction. Moreover, applying the doctrine in question to AI produced works would invert the very purpose of the doctrine, which is to consider a work created by a human being (e.g. an employee) as authored, via a legal fiction, by another entity which is not human (e.g. the employer/company). Conversely, extending this doctrine to the results of computational creativity would end up considering a human person (e.g. a programmer or user of AI creative technology) as author of the output generated by the machine (i.e. a non-human entity).[55]

Could an output created by AI be deemed to be a work derived from the computer code which initially created that AI? The argument would be that the work in question is based upon a pre-existing work, namely the computer code. Unfortunately, this is a weak argument, as the output of an AI generative process often does not have features similar to the ones which characterise the underlying code of the AI. Even the US CONTU Commission accepted that computer-generated works are 'entirely separated' from the underlying program.[56] For example, an output generated by AI may frequently not embody recognizable blocks of expression taken from the

[50] Bridy, note 20, p. 26; see also Hristov, note 27, p. 447.
[51] Bridy, note 27, p. 400.
[52] Palace, note 27, p 235 (proposing to amend 17 U.S.C. § 101 of the US Copyright Act by specifying that a 'work made for hire' is also 'a work generated by a computer in circumstances such that there is no human author').
[53] Glasser, note 27, para 24.
[54] Butler, note 27, pp. 741, 743-744.
[55] Gervais, note 18, p. 46.
[56] CONTU Commission Final Report, note 24, p. 45.

underlying program or from the data the program uses in the creative process.[57] The resulting AI output is often not based upon, or derived from, the code of the underlying program: in fact, the output is produced by the AI itself.[58] It cannot, therefore, be an adaptation under UK law (or, in US parlance, a derivative work) as the latter should include elements extracted from the pre-existing work.[59]

4. The UK 'pragmatic' approach: considering '*the person by whom the arrangements necessary for the creation of the work are undertaken*'

A pragmatic approach is visible in the UK Copyright, Designs and Patents Act 1988 (CDPA) Section 9(3) which provides that '[i]n 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.'[60] The CPDA defines a computer-generated work as one generated by a computer in circumstances where there is no human author.[61] A few other common law jurisdictions have followed this approach.[62]

Section 9(3) CDPA essentially introduces a legal fiction. It considers the author a person who has not directly created the work, but has merely made the necessary arrangements for such production to take place. In this sense the provision expands the notion of author,[63] taking into account the objective creation of the output, and then locating the most plausible nearby

[57] Samuelson, note 18, p. 1215.
[58] Butler, note 27, p. 743.
[59] See also Dorotheu, note 27, p. 90 (noting that '[t]he connection between the programmer's work (i.e. the underlying code) and the final work is too remote' and that in AI scenarios 'the device is thinking entirely by itself. There can no longer be a link to the programmer, irrespective of whether the programmer was the original creator. The relationship exhibits parallels to that of a parent and child. Without the parent, the child would not exist. However, once the child grows up and becomes able to think and interact by itself, the parent can no longer claim ownership over things created by its offspring. There is clear break between the algorithm that underpins the artificial intelligence device and the final output. Therefore the principles of derivative works do not apply, and the programmer cannot claim to be the author through derivative works').
[60] This provision just applies in case of literary, dramatic, musical or artistic works generated by computers. It seems thus to suggest that other types of works that may be produced by machines such as movies, software, or databases are not copyright protected: see Alessio Chiabotto, Intellectual Property Rights over non-human generated creations (2017), available at https://ssrn.com/abstract=3053772.
[61] See Section 178 of the Copyright, Designs and Patents Act 1988.
[62] Namely, Ireland, New Zealand, India, South Africa and Hong Kong. This provision also inspired the 1990 WIPO Draft Model Copyright Law, which provides that the original owner of the economic rights in a computer-generated work may be either the person or entity "by whom or by which the arrangements necessary for the creation of the work are undertaken" or the person or entity "at the initiative and under the responsibility of whom or of which the work is created and disclosed": see International Bureau of WIPO, Preparatory Document, Draft Model Law on Copyright, pp 258-59 (No. CD/MPC/III2, 30 March 1990).
[63] The need for an expansion of the concept of author has been acknowledged for long time in legal scholarship, including in the US since the 1980s: see Butler, note 27, pp. 744-745 (noting that '[w]hen courts find that a given product of AI software is authored by machine rather than a person, the court should presume the existence of a fictional human author').

'author' (and owner), which could also be a company.[64] This provision could plausibly be extended by courts to cover AI-produced output. One criticism of doing so is that it would set the stage for an expansion of corporate ownership of copyright works, something evident in the recent decision of the Chinese court in Shenzhen, referenced above.[65]

Provisions like Section 9(3) of the CDPA evidently constitute an exception to the originality requirement as it has been historically interpreted by UK courts.[66] Traditionally under UK law a work was considered original if it was the result of its author's own 'skill, labour and judgement' – though post-*Infopaq*, the 'intellectual creation' test has been used by UK courts. In any event, in AI scenarios the works produced (by a machine) do not directly originate from any author employing 'skill and labour' - or indeed, 'intellectual creativity'[67] - unless the machine itself is considered an author (a point we reflect on later on in this article).

The legal fiction created by Section 9(3) CDPA is not an isolated phenomenon in UK copyright law. Section 9(2) CDPA also considers as 'author' the producer of a sound recording, the producer of a film (together with the principal director), the person making the broadcast and the publisher of a typographical arrangement of a published edition.[68] Such 'authors' (e.g. producers) are actually often tied via contract to corporate entities (e.g. record companies).[69]

The UK provisions on machine-generated works exclude the applicability of moral rights. The author of these works is therefore not able to claim the attribution right,[70] nor the integrity right.[71] It is logical not to award to such 'fabricated' authors the right to be identified as what,

[64] Also, the CDPA has opted to use the term 'author' when referring to the creator of a computer generated work rather than, for example, the more neutral word 'maker', which is used both in the EU Database Directive to define the person that comes up with a database (Article 7.1). One may thus wonder whether the UK CDPA has tried to 'humanise' computer generated works by avoiding using impersonal and neutral terminology; see also Hart, above note 25, p. 165.
[65] Yangfei, note 45.
[66] Andreas Rahmatian, Originality in UK Copyright Law: The Old 'Skill and Labour' Doctrine Under Pressure (2013) 44/1 International Review of Intellectual Property and Competition Law.
[67] See also Guadamuz, above note 27, p.176; Lionel Bently, mentioned by Begoña González Otero and Joao Pedro Quintais, Before the Singularity: Copyright and the Challenges of Artificial Intelligence (2018) Kluwer Copyright Blog, available at http://copyrightblog.kluweriplaw.com/2018/09/25/singularity-copyright-challenges-artificial-intelligence (stressing that the CDPA provisions on computer generated works do not offer a useful model for protecting AI outputs, because of their incompatibility with the EU copyright *acquis* and failure to address the issue of originality).
[68] See also David Vaver, Translation and Copyright: A Canadian Focus (1994) 4 European Intellectual Property Review, p. 159 (noting, in relation to the expansion of the concept of author, that "computer-generated works join the list of other works for which the UK Act has created a fictitious author:the producer of a film or sound record, the maker of a broadcast, the provider of a cable service programme – almost all of which are equally fictitious persons, that is, corporations rather than humans)".
[69] Ricketson, above note 30, p. 16.
[70] Section 79(2) CDPA; see also New Zealand Copyright Act, Section 97(2)(b).
[71] Section 81(2) CDPA; see also New Zealand Copyright Act, Section 100(2)(b).

in reality, they are not. This point arose during the debate preceding the adoption of the CDPA in 1988; Lord Beaverbrook cast doubts about applying moral rights to computer generated works, because such rights are concerned with 'the personal nature of creative effort'[72] whereas the person who undertakes the arrangements necessary for the creation of these works 'will not himself have made any personal, creative effort.'[73]

5. Applying Section 9(3) CDPA - Considering authorship in the context of programmers and users of AI

Section 9(3) CDPA may be helpful to identify authorship, and to award ownership, in scenarios where original works are produced by computers or robots with no or little human input. In *Nova Productions v Mazooma Games*,[74] the only UK case where Section 9(3) CDPA has been applied so far, the court had to determine whether copyright had been infringed in the graphics and frames generated and displayed on a screen by the users when playing a videogame. It was held that such frames were computer generated works. The programmer was the person who made the arrangements, and therefore the programmer was the author and owner of the copyright. As the Court of Appeal put it - 'the player is not ... an author of any of the artistic works created in the successive frame images. His input is not artistic in nature ... and he has contributed no skill or labour of an artistic kind ... All he has done is to play the game'.[75]

Although Section 9(3) is certainly useful to courts in making such determinations, its usefulness may decline over time, because with each leap forward AI and machine learning technologies become more and more autonomous and independent of humans.[76] Complexities also arise when we consider interactive videogames which offer users the chance to create what would – in another context - be viewed objectively as original works.[77] The game Minecraft is a good example: the aim is to pick up and place 3D objects, such as cubes, arranging them, via personal

[72] See also Boyden, above note 25, p. 391 (noting that works created by machines "need no protection under a moral rights theory as the expression of a human being's personhood, nor under a natural rights theory as intellectual labor, because again there is neither human creativity nor labor involved in their production").
[73] UK, HL Deb (25 February 1988), vol 493, col 1305 (mentioned by Guadamuz, above note 27, p. 176).
[74] *Nova Productions v Mazooma Games* [2007] EWCA Civ. 219.
[75] Ibidem at [106]. A similar conclusion was reached by US courts in *Williams Electronics Inc. v. Artic International Inc.* 685 F.2d 870 (3d Cir. 1982) and *Midway Manufacturing Inc. v. Artic International Inc.* 704 F.2d 1009 (7th Cir.), cert denied, 464 US 823 (1983). In the latter case, the court in particular noted that "[t]he question is whether the creative effort in playing a video game is enough like writing or painting to make each performance of a video game the work of the player and not the game's inventor. We think it is not.... The player of a video game does not have control over the sequence of images that appears on the video game screen".
[76] Lorna Brazell, Can Copyright Survive Artificial Intelligence?, 8 February 2018, available at https://www.scl.org/articles/10139-can-copyright-survive-artificial-intelligence.
[77] Ramalho, above note 25, p.11.

choices, in a 3D grid. In setting up the boundaries of the game, the programmer has allowed players a significant amount of freedom in choosing how to play, permitting them to e.g. build entire cities. In these scenarios – as is the case when works are created via AI - it may not be always easy to identify who has made the necessary arrangements for the resulting work to be created; in other words, who puts the program in the position to create the ultimate work? Is this person the machine's programmer? Or is it the user? Section 9(3) may not provide a clear answer. Determining who that person is should rather entail a careful analysis of the facts, circumstances and specific machine application that generated the work. In conjunction with Section 9(3) a contextual analysis would therefore be necessary[78] – an approach that would seem to be line with the recent *Kogan v Martin* [2019] UK Court of Appeal judgment on joint authorship (a doctrine we consider below).[79] The investigation will likely focus on identifying where did the creative elements in the output of the program originate? Who contributed more to the final product between the programmer and the user? What was the quality and nature of the material each of them contributed?[80] Should ownership be shared on a proportional basis depending on the contributions made e.g. 50/50 or 60/40?

(i) Arguments in favour of the programmer

That a great deal of intellectual effort is required to write computer code is a strong argument in favour of considering the programmers as authors and thus granting them copyright.[81] In this view, the work created by the AI/robot represents the programmer's original intellectual conception because that output can be imagined and generated within the boundaries of the creative space designed by the programmer; and that happens because the programmer is often able to introduce enough constraints and limits on the creative action of both the final user[82] and the machine itself.[83] In other words, the programmer produces the crucial algorithm, and in so doing makes creative choices in selecting the model and preparing the parameter, choosing and apportioning data, determining and double-checking additional steps such as observing and adapting the algorithm after it has become operative.[84] The programmer could thus be

[78] See also Brown, above note 25, p. 24.
[79] *Julia Kogan v Nicholas Martin & others* [2019] EWCA Civ 1645.
[80] Boyden, above note 27, p. 384; see also Miller, above note 25, p. 1059 (highlighting the need to settle for a case-by-case approach that examines the specific facts and the various contributions to the work's creation).
[81] Glasser, above note 27, p. 4; see also Hristov, above note 25, p. 444.
[82] Hedrick, above note 22, p. 346.
[83] Rosen, above note 27, pp. 803-804 (noting that, even though the robot takes decisions on its own, such decisions are taken within boundaries established by the programmer, and that the programmer's decision to put the machine in the position to decide is itself an artistic decision).
[84] Hedrick, above note 22, p. 341.

considered the author of the final work(s) created by the program(s). For this reason Annemarie Bridy remarks that in the AI context programmers are the 'authors of the authors'[85] because 'people-who-write-programs-that-make-art are authors of the art their programs make'.[86]

Proponents of this argument also claim that 'users' often merely press a button, sometimes unconsciously, and sometimes even without knowing they are creating a work.[87] The originality requirement is arguably not met where the person who uses the machine(s) merely pushes a series of buttons and does not employ any kind of skill or intellectual creativity;[88] it is instead the programmer who carries out the more substantial intellectual activity. Awarding copyright to users of the program in scenarios where said users merely press buttons - the argument goes - may encourage people to look for the best programs on the market and then take economic advantage of the final work(s), to which they have not actually contributed anything significant. Furthermore, as a consequence of not receiving copyright in the final outputs of the program, programmers may be de-incentivised from investing in developing new programs capable of generating music, literature or art. Thus, rewarding the users of the program by offering them legal protection may have the adverse effect of creating - downstream - an incentive for 'free riding' and eventually discouraging - upstream - the creation of new cultural products.[89] It may also push programmers and owners of programs to restrict the dissemination and use of AI technologies e.g. via contractual terms, which is arguably an unwelcome outcome since it would restrict user freedom.[90]

(ii) Arguments in favour of the user

Could the user be conceived in positive terms as the person who made the necessary arrangements under Section 9(3) for the creation of the work? Although the programmer or creator of the machine takes upstream decisions as to the purpose for which the program or machine is used, it is the user – one may argue - who eventually triggers the creation of the final output. In this view, programmers merely create a 'potential for a creation'[91] and not its

[85] Bridy, note 20, p. 21.
[86] Bridy, note 20, p. 25.
[87] Yet, this argument cannot be relied on when it comes to highly interactive programs such as modern videogames, including the above mentioned Minecraft, where users have an active role in the creative process.
[88] Dorotheu, above note 25, p. 90. Yet, see also Samuelson, above note 17, p. 1202-1203, reminding that who tape-records a live performance of a sound recording, i.e. a person who just presses a button, is considered as 'author').
[89] Perry and Margoni, above note 27, p. 8.
[90] Hristov, note 27, pp. 444-445.
[91] Glasser, note 27, p. 5; see also Yanisky Ravid, above note 19, pp. 670, 675 (adding that "the human inventor or programmer of such a machine seems to have no more claim to a copyright in such a work than an artist's mother

actuality.[92] Programs and machines are, in this sense, viewed as mere tools engineered to be useful for the creation of works by the final users. [93]

In fact, at times the user is the person who sets the parameters and provides data for the algorithm in ways that significantly influence the final work; and in some circumstances the user may even affect the way the algorithm functions.[94] Take for example an AI enabled program capable of producing music, such as Jukedeck, where the user provides relevant inputs that affect the song being created, including selecting the instruments, choosing the musical key or tempo, and selecting a musical style for the composition. The final musical work could be considered the culmination of creative inputs triggered by that user.[95] That users in such cases have a closer connection with the generation of the ultimate output is reinforced by the fact that the same program, used by different persons, could result in many different sets of outputs, depending on the creative choices made by each user, and regardless of the choices previously made by the programmer.[96] As the program becomes more sophisticated the works would get more varied because of the program's associative elements, with the result that individual compositions triggered by different users would very rarely, if ever, be identical.[97]

A positive of viewing users as authors, and accordingly awarding them rights, is that it would encourage them to obtain and operate the program in order to create new works,[98] which would put them in the optimal position to bring the final outputs to the market.[99] This could eventually benefit programmers as well, because users would be incentivised to buy the program and thus increase its overall value. [100] Notably, the market already supplies programmers with the

has to her child's work, or than a camera manufacturer has to the photos taken by photographers, or than a piano manufacturer has to the melody being created by the musicians while using the instrument").

[92] Samuelson, above note 17, p. 1209.

[93] Samuelson, above note 17, p. 1220. See also Caen A. Demic, AI-Generated Fashion Designs: Who or What Owns the Goods? (2020) Fordham Intellectual Property, Media and Entertainment Law Journal (making the point that – when it comes to AI creations in the field of designs - end users, namely fashion houses or independent designers, should be considered authors).

[94] Hedrick, above note 20, pp. 344-346.

[95] Yanisky - Ravid, above note 19, p. 706; see also Ralston, above note 25, p. 290 (noting that controls are often provided by the programmer to users, including enabling/disabling music input, enabling/disabling random input, random number generator parameters, and composer module parameters).

[96] Hedrick, above note 22, pp. 344-346.

[97] Grubow, above note 16, p. 410. Yet, see also J. Yu, above note 25, pp. 151-152 (noting that there may be scenarios where all works reached by using the same machine are identical or similar, and therefore under these circumstances "the programmer has a better claim to fixation than the user. If the program generates the same image every time a user provides a certain command, then the creativity displayed in the output must have come from the programmer. After all, it would be strange to ascribe authorship to the user where the same output would have been generated no matter which human author caused the output to be generated").

[98] J. Yu, above note 27, p. 162.

[99] Hedrick, above note 22, p. 344-346.

[100] Brown, above note 27, p. 39; see also Cronin, above note 25, p. 19 (noting that purchases of programs by users would motivate the programmer to create the software in the first place).

incentive to create the software and machines which are used to produce works - the incentive arising from the prospect of maximising profits due to sales and licensing[101] as well as from copyright (and sometimes patent) protection of the software itself.[102] Awarding copyright to programmers for the outputs as well would therefore be to provide over-protection (or what is known colloquially as 'two bites at the apple'[103] and 'double dipping').[104]

6. Joint authorship?

It is logical to argue that the contributions towards the creation of the final output/work) often come from *both* the programmer of the machine (upstream) and the user (downstream).[105] To use a metaphor from the natural world, under a joint authorship analysis the programmer may be considered as planting the initial 'seed' with the user watering it and finally harvesting the creative 'fruits' of the plant.[106] In other words, the programmer and the user could be seen as co-operating, with the latter adding some creative input and fixing the work under the authority of the former.[107] In one sense the copyright requirements would apparently be satisfied, with both the programmer and the user contributing sufficient originality towards the final work.[108] Judges that are called to determine disputes regarding authorship and ownership of AI-generated works might be willing to follow this line of argument and find that programmers and users are joint authors. Nonetheless, there is a significant problem - it will be difficult to establish a crucial requirement for joint authorship to materialise under UK law (and a similar requirement exists under US law) namely a common intent and design between the programmer and a remote user, two individuals that typically do not meet and often do not even know each other. In other words, under these circumstances the kind of agreement and harmony of interest

[101] Denicola, above note 25, pp. 283-285; see also Samuelson, above note 17, pp. 1203, 1207-1208 (noting that by licensing the use of the generator program the programmer implicitly grants the user rights in whatever output is generated from the computer program; and that the purchaser of the program can reasonably assume that the acquisition of the program brings with it the right to use the created output).
[102] Yanisky and Ravid, above note 19, p. 702.
[103] Brown, above note 27, p. 37.
[104] Yu, above note 27, p. 1264; see also Dorotheu, above note 25, p. 89 (noting that the idea that the programmer would automatically own everything that the AI device is capable of producing would be an undesirable outcome as it would over-reward the programmer). See also Denicola, above note 25, pp. 283-285 (arguing that giving programmers copyright may often turn out to be useless as programmers themselves would frequently be anaware of the creation of works by users).
[105] See McCutcheon (2013B), above note 25, p. 56.
[106] Glasser, above note 27, p. 7.
[107] Ralston, above note 27, pp. 295-296; see also Boyden, above note 25, p. 386 (perceiving the collaboration between the programmer and user as a sort of spectrum and noting that "[a]s the amount of user control over the work increases, the programmer contributions decrease").
[108] Samuelson, above note 17, pp. 1202-1203 (comparing the user to the person who records a jazz improvisation session, and therefore fixes the work).

that is typical of joint authorship scenarios is lacking.[109] Even recent liberal and 'contextual' approaches to joint authorship – such as the UK Court of Appeal decision in *Kogan v Martin* - emphasise the need for a common design. A final complication is that even if awarded, joint ownership between two remote persons might be difficult to administer in practice, as the copyright would be owned jointly and both authors/owners would need to give consent for e.g. licensing.[110]

7. Investors as authors?

Could others be identified as possible candidates for the role of author? What about the (corporate) investor? From an economic perspective, one may argue that the entity or even the individual that has invested financial and human resources in a technology which is capable of creating music, literature or art would reasonably expect some form of return on the investment.[111] Although an investor's authorship claim may not be strong because the creative act has not been carried out by the investor itself, an argument could be made about an extension of the 'work made for hire doctrine' so as to cover situations where the final work is produced using AI technology promoted by the investor, with the 'creative machine' taking the place typically occupied by an employee and the former playing the role of the employer.[112] This argument is not particularly convincing, but it cannot be dismissed out of hand.

8. Machines as authors?

Is the computer, machine or robot a potential candidate for authorship? Certainly, the more independent AI systems become, the harder it is to identify a human being responsible for the arrangements that lead to the generation of the final output higher up the chain. In this view, only the machine can be said to make the key creative choices, understood under the originality doctrine as being based on intellectual creation or skill and labour,[113] because only the machine

[109] Samuelson, above note 17, p. 1222; see also Butler, above note 25, p. 740 (noting that "[i]n the man-machine joint author situation, the concept of an 'agreement' has little meaning").
[110] Ralston, note 27, p. 306.
[111] Hewitt, note 27, p. 236-37.
[112] Hewitt, note 27, p. 236.
[113] Timothy Pinto, Robo ART! The Copyright Implications of Artificial Intelligence Generated Art (2019) 30/6 Ent. L. R., p. 177 (making the point that the UK originality test allows for copyright in AI generated art to subsist even where there is no human author; and in particular that it is easier to accept that an AI machine exercises skill, labour and judgement). See also Jacob Turner, Robot Rules: Regulating Artificial Intelligence, Palgrave Macmillan US, 2008, p. 122 (noting that "there is a good argument for saying that AI is even *more* creative than humans, in that all humans are restricted by our biological faculties, whereas AI is capable of 'thinking' and operating in an entirely different manner").

is involved directly with the production of the work.[114] Thus, when the output of a computer contains any 'deviations from its input' the output should be considered as 'written' by the computer.[115] Any instructions and directions from the (human) programmer and user would be seen as merely the catalyst for the creation of the final work, the final form of which would be 'unforeseeable' from the perspective of the human.

As ownership follows authorship, if we consider a machine to be the author of a copyright work, should such a machine also be considered as the owner of the relevant economic rights (leaving aside the ownership of moral rights)? It we take this argument to its logical conclusion, robots would indeed be awarded legal rights. After all - this argument goes - the law recognises that other non-natural 'persons', such as companies, have rights under the law, so it would not be a revolutionary step to provide other non-human entities – i.e. AI/machines/robots - with legal rights.[116]

This may appear, at first sight, to be a fascinating and imaginative scenario - yet, it is unlikely to materialise, especially with respect to recognising the legal rights of AI/robots.[117] The first strong (and obvious) objection is that machines, computers and robots lack legal personhood and therefore are not entitled to claim any legal rights including copyright.[118] Giving AI/machines/robots legal rights would require, *ex ante*, answering complex questions about agency - whether machines should be considered not as mere products but as employees or agents;[119] and that would necessitate a further assessment of liability issues (in relation to possible violations of rights of others committed by machines). This would be a legal, political and philosophical challenge.[120] From a practical perspective, it is difficult to imagine a machine

[114] Grubow, above note 16 (noting that "[n]eural networks are an AI's unique DNA and, perhaps, give AIs their 'personality' which allows for greater variance in its outputs as it learns more music. This function is no different than when a human composer's compositional style changes as they are exposed to new musical styles. Both entities grow with experience").
[115] Milde, note 27, p. 403 (also noting – at pp. 393-395 – that, when the computer exercises independent creation, it should at least be considered a co-author of the work it creates, together with the programmer and the person who provided it with data); on AI as co-author see also Grubow, above note 16, pp. 416-418. For an opposite position see Butler, above note 25, pp. 740-741 (noting that "[i]n the man-machine joint author situation, the concept of an 'agreement' has little meaning. … the law does not contemplate a man/machine 'joint author'").
[116] Dorotheu, note 27, p. 91.
[117] See also Miller, note 27, p. 1043 (noting that '[t]he technology has not yet produced a world of copyright without human authors, and there is no reason to believe that we are en route to that world or, even if we are, that we will reach it in the foreseeable future)'; Ginsburg and Budiardjo, above note 27 (making the argument that all computers, even the most advanced in machine learning, do not originate anything, but they just follow orders); Grimmelmann (2016), above note 25 (starting his article by noting: "I would like to talk about computer-authored works—I would like to, except that they don't exist"); J. Yu, above note 25, p. 156.
[118] Bridy (2012), above note 20, p. 21; Butler, above note 27, p. 740 (noting that "the notion of a machine having legal rights and duties is absurd").
[119] Dorotheu, note 27, p. 91.
[120] Dorotheu, note 27, p. 91.

being capable of possessing legal standing to claim copyright infringement, or negotiating and signing transfers or licences of its rights to others.[121] Further to this, the analogy with a company's legal personality is weak, as companies/corporations are vessels for the activities and actions of humans – companies only act through their managers, shareholders, or employees – and this direct connection cannot be easily compared to the choices made by AI.[122] For this reason, the case for AI to be awarded the rights of the author/owner cannot be supported.

Having considered the issue of artificial intelligence as creative producer, we next consider how AI consumes and makes use of existing copyright works and data in order to learn and create new works. What are the consequences of this for copyright?

ARTIFICIAL INTELLIGENCE AS CONSUMER

Creative machines consume. They often devour huge amounts of data as part of learning processes including books, photographs, images, articles, social media feeds, videos, and other kinds of content. Data are the building blocks of algorithmic creativity.[123]

Programs that generate music, for example, are fed with huge quantities of source material, from hits at the top of the chart to lesser known pieces, which they assess with a view to finding patterns. Programs process elements such as length, tempo and chords, and how musical notes relate to one another, learning from all the input that has been fed into the machine so that they can compose new melodies.[124] A similar process occurs in the case of AI-generated figurative art. The Next Rembrandt artwork was created after the machine had been fed with high-quality scanned images of 350 paintings by the Dutch maestro; meanwhile, over 150 gigabytes of digital graphics were used to give the machine instructions to come up with the textures and layers necessary to have the style of a Rembrandt's original painting.[125] The final artwork received mixed reviews from critics, dismissed by one as 'fan-fiction' – though it is worth noting that even fan-fiction can have an artistic and monetary value.[126]

[121] Glasser, note 27, para 30-31; see also Butler, above note 25, p. 739 (wondering how a machine could be a real party in interest in a lawsuit); Farr, above note 25, p. 79; Clifford, above note 25, p. 1686 (noting that "the computer would need the power to engage in voluntary and knowing behaviour").
[122] Dorotheu, note 27, p. 91.
[123] Sobel, note 27, p. 1.
[124] Dani Deahl, How AI-Generate Music is Changing the Way Hits are Made, 31 August 2019, available at the webpage https://www.theverge.com/2018/8/31/17777008/artificial-intelligence-taryn-southern-amper-music.
[125] Yanisky-Ravid, above note 19, p. 669.
[126] Peter Schjeldahl, A Few Words About the Faux Rembrandt, The New Yorker, April 8 2016:

What is crucial is that AI systems learn by accessing and analysing *pre-existing* works and data in order to produce the final work. From a copyright perspective, this raises an issue: amongst such pre-existing outputs which are accessed and analysed by AI machines, there are often works protected by copyright that are owned by third parties. What are the consequences of this from a legal perspective?

1. Copyright infringement risks

Issues of copyright infringement inevitably arise in this context, as vast amounts of copyright works fall within the net of these creative machines; indeed, infringement may occur in relation to both the *inputs to* and *outputs* of AI.[127] As far as the former is concerned, the risk is that a violation of the reproduction right may materialise - machines need to reproduce the data they access during the learning process. As to the latter, such final outputs may be considered as the result of an adaptation of the works that are assessed by the machine.[128] Since algorithmic creativity has evolved to the point where it can interpret authors' and artists' styles in digital forms, basing the new works on the existing universe of works previously produced by such authors and artists, the infringement analysis here will be dependent on the possibility of recognising in the final product the features of the works used in the training process. If the original upstream work has been so changed and transformed that marginal similarities remain in the machine-created output, no infringement would take place. On the other hand, should the final product generated by the robot include identifiable and non-secondary elements of an original work, an infringement of the adaptation right is likely to materialise.[129]

Infringement analysis may turn out to be complicated in practice; for example, US law requires the copyright owner to prove that the defendant has had access to the copyright work before reproducing and adapting it. In particular, when it comes to AI creative machines, malicious and bad faith behaviours may occur to try to 'disprove' such access, with e.g. the programmer being tempted to remove a work (e.g. a song or a video) from the master list thereby cancelling it from the computer's memory.[130]

https://www.newyorker.com/culture/culture-desk/a-few-words-about-the-faux-rembrandt

[127] See also Celine Melanie A. Dee, Examining Copyright Protection of AI-Generated Art (2018) Delphi – Interdisciplinary Review of Emerging Technologies, p. 36.

[128] Sobel, above note 25, p. 16.

[129] Jean-Marc Deltorn, Deep Creations: Intellectual Property and the Automata, 1 February 2017, available at https://www.frontiersin.org/articles/242911.

[130] Stephen Carlisle, Should Music Created by Artificial Intelligence Be Protected by Copyright? 7 June 2019, available at http://copyright.nova.edu/ai/; see also Sobel, above note 25, p. 20 (focusing on the difficulties to assess

2. The fair use debate under US law: distinguishing non-expressive from expressive uses

As AI and machine learning's creative abilities are based on the upstream collection and analysis of data, it is important to determine when the use of such information by the computer can be considered as fair use under US law and thus exempted from copyright infringement. Accurate fair use analysis should be based on the distinction between expressive and non-expressive use of copyright material; while the former may not be exempted from copyright infringement, the latter is often deemed sufficient to escape liability.[131] Existing US case law involving technology companies may help to understand this distinction and could be applied *mutatis mutandis* to AI scenarios. Two relevant cases are *Kelly v. Arriba*[132] and *Perfect10 v. Amazon*.[133] In both cases the defendants provided image search engines services. The plaintiffs (claimants) in Kelly and Perfect10 owned copyright covering certain images that had been reproduced in thumbnail form, stored on defendants' servers, and shown to Internet users who used Arriba and Amazon services. The courts held that the defendant's activities were transformative fair uses - and considered the image search engines managed by the defendants as simple tools. The courts found that they were not vehicles used to convey expression and the use of the copyright material by Arriba and Amazon was merely instrumental, being absent any artistic or aesthetic purpose.[134]

US courts made similar rulings in two other cases, namely *Authors Guild v Google*[135] and *A.V. ex rel. Vanderhye v iParadigms*.[136] The first dispute focused on the Google Books Library Project, which consists of scanning and making searchable the book collections of major research libraries. The court found that making copies when the aim is to allow the easy search

access to copyright works, and in particular noting that "[t]he situation is indeed complicated when an allegedly copied work is absent in input data. This phenomenon could have several causes: perhaps the model was programmed to find input data by crawling the web on its own, and its activities were not logged. Or, most intriguing, perhaps the model was given a known, finite set of input data that excluded the plaintiff's work, and nevertheless created substantially similar output. This is not as farfetched as it sounds: consider a machine learning model instructed to generate funk music, trained on a corpus of all funk recordings except the work of James Brown, the definitive originator of the genre. All funk songs bear a debt to James Brown, so it would not be altogether surprising if the funky AI generated output that was substantially similar to his work").

[131] Sobel, above note 25, p. 1; Linn, above note 25, p. 849.

[132] *Kelly v. Arriba and Perfect10 v. Amazon* (*Kelly v. Arriba Soft Corp*, 336 F.3d 811 (9th Cir. 2003).

[133] *Perfect 10, Inc. v. Amazon.com, Inc.*, 508 F.3d 1146 (9th Cir. 2007).

[134] For the first judicial acknowledgment of non-expressive fair use, see *Sega Enterprises Ltd. v. Accolade, Inc.*, 977 F.2d 1510 (9th Cir. 1992).

[135] *Authors Guild, Inc. v. Google, Inc.*, 954 F. Supp. 2d 282 (S.D.N.Y. 2013); Authors Guild v Google Inc., 804 F (3d) 202 (2nd Cir 2015).

[136] *A.V. ex rel. Vanderhye v. iParadigms*, L.L.C., 562 F.3d 630 (4th Cir. 2009).

and identification of books that contain a term of searchers' interests is transformative and therefore fair. Such service – the court added - does not displace or substitute books because it is not an instrument that people use to read the books – it just facilitates their search. The second case focused on the plagiarism detection service Turnitin (the program consists of checking the submitted documents against its database made of large quantities of papers and material). Again, no copyright infringement was found by the judge because the use of digital copies of copyright works by the programme was considered totally unrelated to expressive content, transformative, and therefore incapable of producing a market substitute.[137] More precisely, the court held that Turnitin does not use the papers for their creative meaning and even though it stores the whole document, it does not publish a full copy of it for other people to access and see it.

This bolsters the argument that certain non-expressive and non-creative uses of copyright works by AI machines would also constitute fair use under US law. Take for example datasets used to train facial recognition AI (such technology is able to recognise a person from a digital image). Although training a facial recognition machine often entails copying large quantities of copyright protected pictures, what is being used by the programme does not relate to the creative and expressive choices made by the photographers – such use focuses instead on matching facts about people's identity with facts about their physical resemblance.[138] This is arguably fair use. Similarly, imagine a caretaker robot which accompanies its blind owner to a museum, with the robot taking pictures of the walls to read the exhibits and bringing the blind owner to the artworks she prefers (or even taking pictures of the sculptures that may represent obstacles in her path).[139] Again, here the copyright works (paintings and sculptures) are reproduced just for the purposes of pattern recognition, which makes the use non-expressive and therefore fair.

A different scenario would occur where copyright works are used to train algorithms for developing new creations. The use of the source material could be considered expressive. With *The Next Rembrandt* artwork the machine was 'imbued' with all the paintings created by the Dutch artist for training purposes so as to be able to generate a work of art in the style of Rembrandt. Another example is the *Portrait of Edmond Belamy*, an AI-produced artwork sold

[137] Giovanni Sartor, Francesca Lagioia and Giuseppe Contissa, The Use of Copyrighted Works by AI Systems: Art Works in the Data Mill (2018), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3264742.
[138] See Benjamin Sobel's interview with the intellectual property blog Ipwatch, available at https://www.ip-watch.org/2017/08/23/dilemma-fair-use-expressive-machine-learning-interview-ben-sobel/.
[139] This example is given by Schafer - Komuves - Zatarain - Diver, above note 25, pp. 23-24.

by auction house Christie's in October 2018 for US$432,500 -[140] the work was generated after the machine was fed with a dataset of 15,000 portraits painted between 1300 and the 20th century. The use of the source material in both cases was not merely mechanical and instrumental – it was instead expressive because it aimed at producing a creative output.

One may thus argue that expressive uses of copyright works by AI systems should not be exempted from copyright infringement via the fair use defence, especially if the final output is going to be exploited commercially and not, for example, used for research purposes.[141] These uses are indeed likely to affect the markets where the copyright owner is active.[142] In particular, authors and artists whose works are analysed and used as source material and in training exercises may be deprived of markets they exploit.[143]

Issues of fairness and balance between rights and obligations should also be taken into account. If programmers, owners or users of AI systems want to claim exclusive rights over the final outputs generated by their machines, they should also accept responsibility for those works, in relation not only to copyright infringement, but also to – for instance - libel or any other source of liability.[144] This point makes sense: if you are the one who claims to be an 'author/owner' as a result of the generative process carried out by the AI system, you should also be liable for when the computer infringes the rights of others.[145]

Giving algorithmic creativity a generous fair use treatment, allowing machines to access and use freely existing copyright material for training purposes, may not produce a positive outcome. Why should the programmer, owner or user of a robot which consumes huge quantities of copyright works for creative purposes be exempted from asking for authorisation for such massive use, while a human creator doing the same on a much lower scale cannot take advantage of such exemption?[146] What should therefore be avoided is a binary copyright regime

[140] See above note 15.
[141] There is obviously no point in engaging in a fair use debate when the works analysed by the machine have already fallen into the public domain, and therefore are not protected by copyright anymore, as happened for *The Next Rembrandt* (the Dutch maestro died in 1669).
[142] Linn, above note 25, p. 850 (commenting on the AI music composer Jukedeck and noting in particular that "[t]here is no doubt that AI-generated, royalty-free sound recordings would jeopardize the market for recordings that are composed and performed by humans in a traditional fashion. Jukedeck's rates are lower than what it would cost to license a conventional sound recording, and its output is not limited by the constraints human composers or recording artists face").
[143] Sobel, above note 25, p. 31.
[144] Gervais, above note 17, pp. 36-38 (noting that "with rights comes responsibilities").
[145] Carlisle, above note 133.
[146] Sobel, above note 25, p. 34; see also Linn, above note 25, p. 851 (arguing that machines that create commercially valuable music, literature and art after being trained on copyright material "chafes uncomfortably against interests that normally attract infringement liability if done by humans").

which discriminates between human creators who access, analyse and use pre-existing copyright works and robots who substantially do the same but at a higher speed and with a much wider reach.[147] Terminology may also help explain the risk of a double-standard copyright system. When human beings access and use pre-existing source material, what has been used is called 'works'. When the same is done by learning machines, the preferred word is the much more apparently neutral term 'data'.[148]

There is also a 'human displacement' argument. If using copyright source material as input data for AI machines becomes rampant and unlimited, some portions of the creative industries markets may become totally automated.[149] In other words, if copyright regimes treat machines more favourably than they treat humans (by giving them an easier access to the fair use harbour) in the long run human beings might not be disadvantaged and prevented from competing with robotic competitors which could reduce human creative efforts. AI could become so adept at creating music, art, movies and literature without the need of clearing rights as to eventually become capable of superseding human ingenuity. Would such a scenario be welcomed by humans? The answer is certainly 'no'.[150]

A stronger argument could be made in favour of a relaxed fair use regime for AI – aimed at avoiding biases during the algorithmic creative processes. How can biases occur? Most 20th century and early 21st century works are protected by copyright and therefore cannot be reproduced and adapted without permission, a fact which may limit the analysis of data by AI technologies. Amanda Levendowski argues that copyright law restricts access to and use of training data to works in the public domain, which may contribute to biased AI.[151] Most extant public domain material was created at, or before, the beginning of the 20th century, when the dominant narrative in the arts and literature was 'wealthier, whiter, and more Western than it is today'.[152] A dataset consisting solely of such public domain source material would inevitably

[147] Grimmelmann (2016B), above note 25, pp. 658 and 674-675 (noting provocatively that "copyright has concluded that reading by robots doesn't count. Infringement is for humans only; when computers do it, it's fair use"; adding that "a transformative fair use that categorically exempts robots means that a digital humanist can skim a million books with abandon while a humanist who reads a few books closely must pay full freight for hers"; and that "[r]ebroadcast one radio station for humans and you're an infringer; copy a thousand TV stations for computers and you're a fair use hero".

[148] Amanda Levendowski, How Copyright Law Can Fix Artificial Intelligence's Implicit Bias Problem (2018) Washington Law Review, p. 625 (also noting that "A best-selling novel becomes data about how humans use language; a selfie becomes data about the features of the human face; a conversation from a film becomes data about human voices").

[149] Linn, above note 25, p. 850.

[150] Sobel, above note 25, p. 41.

[151] Levendowski, above note 153, p. 589.

[152] Levendowski, above note 153, p. 589.

ignore voices that had not been made public before the early 20th century, including those of women, people of colour or members of the LGBTQI+ communities.[153] On the other hand, if under the fair use doctrine AI can access, reproduce and analyse all copyright material, the range of pre-existing works that could shape and influence the final (machine generated) outputs would be more recent, modern, diversity-cognisant, tolerant and thus less biased. Under these circumstances AI systems not only would be able to use any kind of work to train their algorithms - they could also make public the kind of material that has been fed into the system without being afraid of copyright objections.[154] Therefore using copyright works as training data is important to minimise the risk of imbuing AI with biases that perpetuate old fashion attitudes, behaviours and social norms. Seen from this perspective, extending fair use to AI systems – especially in relation to expressive uses of copyright source material - would promote fairer algorithmic systems that may contribute to mitigating biases and making society more tolerant.[155]

Yet, it remains to be seen how an extension of such doctrine to computational creativity to allow access to huge quantities of copyright material can be reconciled with the need to avoid a binary copyright system which treats algorithmic ingenuity more favourably than human genius and may eventually constitute a threat to the latter.

3. Exempting AI uses of copyright material under EU law & UK fair dealing

What about Europe? Given there is no direct equivalent of US transformative use under UK fair dealing, it is necessary to consider the issue through the prism of the narrow exceptions provided under EU law. The key EU copyright rule that could exempt certain mechanical and non-expressive uses of copyright works by AI machines – especially, the reproduction of input source material fed into the system - is the transient copy exception under the Information Society Directive. [156] This provision – which remains applicable in the UK, Brexit notwithstanding - exempts temporary acts of reproduction provided that they are transient or incidental, an essential part of a technological process, enable the lawful use of a work and have no independent significance. It allows the reproduction of a copyright work if the copy is

[153] Levendowski, above note 153, p. 589.
[154] Louise Matsakis, Copyright Law Makes Artificial Intelligence Bias Worse (2017) available at https://motherboard.vice.com/en_us/article/59ydmx/copyright-law-artificial-intelligence-bias (also noting that in reality, due to potential copyright implications, "major AI companies keep the data they use to train their products a secret, preventing journalists and academics from uncovering biases, as well as stifling competition").
[155] See again Lewandoski, above note 151, p. 630.
[156] See Article 5(1) Directive 2001/29/EC on the harmonisation of certain aspects of copyright and related rights in the information society ('Info-Society Directive'). See also cases of *Infopaq* and *Meltwater*.

necessary to carry out technological and mechanical tasks of no autonomous value - with the classic example being the temporary copy of a webpage stored in the browser's cache. This exception could potentially cover AI scenarios.[157]

Consider the example of a machine searching for online information on weather forecasts to schedule free days for customers, with extracts of such information being stored in the machine as transient or incidental copies just for the purpose of transmitting a work across a network between third parties.[158] Reproducing the works seems here essential to the training process - and the copies need not be kept in the system after running through the neural network. This use of copyright material (i.e., extracts from weather forecast) is non-expressive – and will likely be considered legal under EU copyright law (as well as in UK law and in the laws of most EU Member States).[159] As copyright owners in such circumstances do not suffer economic harm, the use of the protected works is likely to pass the 'three-step test' under the Information Society Directive, which states that any exception under this piece of legislation, including the transient copy exception, 'shall only be applied in certain special cases which do not conflict with a normal exploitation of the work or other subject-matter and do not unreasonably prejudice the legitimate interests of the rightholder'.[160] Furthermore, in the case of *Football Association Premier League v QC*[161] the CJEU highlighted the need to strike a fair balance between the interests of copyright owners and the users of protected works who would benefit from copy-reliant technologies.

There is another exception in EU copyright law that may be relevant in these scenarios. It is the text and data mining exception to the reproduction right introduced by the 2019 EU Directive on Copyright in the Digital Single Market (at time of writing it appears the UK government has indicated it will not bring this into UK law).[162] Could uses of copyright material fed into the AI platform be exempted under this provision? Text and data mining activity allows the extraction and use of significant amounts of digitally available information[163] to e.g. discover scientific

[157] See also Thomas Margoni, Artificial Intelligence, Machine Learning and EU Copyright Law: Who Owns AI? (2018) CREATe Working Paper 2018/12.
[158] This example is given by Schafer, Komuves, Zatarain and Diver, above note 27, pp. 26-27.
[159] Schönberger, above note 27, pp. 16-17.
[160] Article 5(5) of the Info-Society Directive.
[161] *Football Association Premier League Ltd and Others v QC Leisure and Others* (C-403/08) and *Karen* Murphy *v Media Protection Services Ltd* (C-429/08).
[162] See Articles 3 and 4 of Directive (EU) 2019/790 on copyright and related rights in the Digital Single Market. Article 3 in particular exempts from copyright infringement the reproduction of copyrighted material.
[163] See Article 2(2) of Directive (EU) 2019/790 which defines text and data mining as "any automated analytical technique aimed at analyzing text and data in digital form in order to generate information which includes but is not limited to patterns, trends and correlations".

research opportunities in corporate documents, social media feeds, medical records, academic articles and other sources of text-based data.

This technique is potentially useful to AI creative platforms that are fed with vast quantities of data. Yet, the exception under the EU Directive is limited. First, the text and data mining activity can be carried out freely only by research organisations and cultural heritage institutions for the purposes of scientific research.[164] This provision may push AI companies that engage in text and data mining to opt for public-private partnerships with public research centres;[165] but any commercial exploitation of the final work created by the machine after being fed with the copyright material will likely be strongly limited, if not excluded entirely.[166] Another provision of the Directive appears in principle to allow text and data mining activities by business and for-profit entities, and for any purpose (for example for the reproduction of copyright material).[167] Yet, such exception does not apply if copyright owners have reserved the right to mine – which means that the exception can be easily overridden by the copyright owners' indication that they do not want to allow such activity.[168]

The limitations to the text and data mining exception under EU law significantly restrict the opportunities for AI business-oriented organisations to carry out such activities in the context of machine learning platforms – and this is true in relation to both expressive uses of prior copyright works for creative purposes (which can be hailed as a positive outcome in light of the arguments developed earlier in this Part) and non-expressive and merely mechanical uses of such material (which can be considered instead a negative outcome taking into account that such uses have less chances of prejudicing the interests of copyright owners). On the other hand, research centres, heritage institutions and other similar entities that use AI for non-profit purposes will be free to engage in text and data mining activity. It remains to be seen if (in addition to merely mechanical uses of pre-existing copyright works) non-profit organisations can also engage under this exception with respect to expressive and creative AI uses of the mined data; a clarification by some EU Member States' national courts or even the CJEU on this issue may be required. Having considered the issue of AI as consumer, we now return to the question of how to deal with the production of new works by AI.

[164] See Article 3 of Directive 2019/790.
[165] See also Recital 11 of Directive 2019/790 (highlighting EU policies which encourage "universities and research institutes to collaborate with the private sector").
[166] The UK CDPA also provides a text and data mining exception, which is limited to the copying of works for the sole purpose of research for a non-commercial purpose: see Section 29A of the CDPA.
[167] See Article 4 of Directive 2019/790.
[168] Eleonora Rosati, Copyright as an Obstacle or an Enabler? A European Perspective on Text and Data Mining and its Role in the Development of AI Creativity (2019) Asia Pacific Law Review, p. 21.

EVALUATING THE PUBLIC DOMAIN AND SUI GENERIS RIGHT AS SOLUTIONS

Having outlined the various problems with awarding ownership to the programmer or user (separately or jointly) or to the AI/machine itself, we turn now to alternative proposals that may provide a solution to the question of whether and how the results of algorithmic creativity should be legally protected.

1. The public domain solution

A tempting option could be to deem the works created by machines as automatically entering the public domain. As there is no human author directly involved in the creative production of the output we could argue no one should be able to claim exclusive rights over it.[169] Works produced by robots would thus be comparable to things found in nature, like music that the wind generates when it moves through wind chimes or the sounds of a waterfall, or birds singing at dawn -[170] outputs which cannot be monopolised by anyone.[171] There is also an (obvious) incentive-related argument that supports this position. Machines are not able to respond to the incentives/rewards offered by copyright - and therefore their works should remain in the public domain (at least until technology evolves deeply so as to give machines some sort of human-like consciousness, but for now we can eliminate this possibility).[172]

This solution would also neutralise the anti-competitive risks that an over-proliferation of strong and long-lasting exclusive rights protecting AI produced output, owned by corporate entities, may bring. Seven commercial companies working with AI technologies – Apple, Google, Microsoft, IBM, DeepMind, Facebook and Baidu – already dominate this lucrative market.[173] The scenario would turn even more anti-competitive if a US-style work-made-for-

[169] Gervais, above note 17, p. 10 (noting that "machine productions are *not* protectible by copyright once the machine has crossed what the Article calls the autonomy threshold and is no longer a tool in the user's hands or a reflection of its (human-made) program"); see also Yu, above note 27, pp. 1265- 66.

[170] Khoury, above note 27, p. 668; see also Hewitt, above note 27, p. 235.

[171] Linn, above note 27, p. 840 (noting how according to several commentators the fall into the public domain of these works will provide fertilizer "to give birth to new artistic genres and whole new areas of innovation, where humans could build freely upon initial machine-output").

[172] Clifford, above note 25, pp. 702-703.

[173] Levendowski, above note 153, p. 597. See also Michaux Michaux, B., 'Singularité technologique, singularité humaine et droit d'auteur', in Laws, Norms and Freedoms in Cyberspace/Droits, norms et libertés dans le cybermonde (2018) Larcier, pp.401-416 (noting that copyright protection of AI-produced outputs could bring an increase in the number of protected works and favour the concentration of copyrights in the hands of a few companies).

hire approach were used in relation to these works – with the programmer/employer considered the author and thus copyright owner; the same would likely result if the UK Section 9(3) approach were used. There is little doubt that AI companies would be attracted by the idea of securing ownership of exclusive rights in such works – it may even encourage them to hoard their AI technologies, so as to always remain the 'employers' and therefore the right-holders. This would consolidate the dominant position of a few tech companies.[174]

The public domain option is not just a theoretical proposal - it is already operative in jurisdictions such as the US which (as we have discussed earlier) do not explicitly protect, via copyright, works generated by machines.[175] Australian copyright law does not consider such works protectable either.[176] In these jurisdictions public domain seems the default position. Several scholars support this approach.[177]

Is this solution desirable? Would the refusal to offer works generated via algorithmic creativity legal protection discourage investments in, and dissemination of, the underlying AI technologies? Given that the law of copyright (and in some cases, patents) is already available for protecting the underlying programs themselves, even if not the outputs, it is plausible that a sufficient incentive already exists. On the other hand, without the lure of the exclusive rights offered by copyright we cannot rule out that the incentives to develop and make available AI/machines capable of creating musical, literary or artistic outputs could be lessened.[178] As this argument goes, denying legal protection of machine generated outputs may not have the effect of increasing the public domain in the long term; it could instead reduce the incentives to create new AI works, and may ultimately lead to a lower number of these outputs being produced, and accordingly, a decrease in works that would eventually enter the public domain. In this view, the arts, education and technology sectors may not see sufficient investments into valuable research into future AI applications.[179]

[174] Palace, above note 257, p. 237.
[175] See above note 37.
[176] See McCutcheon's articles, above note 27.
[177] See for example Bently, above note 67, Perry-Margoni, above note 25; Gervais, above note 17; Garry Gabison, Who Holds the Right to Exclude for Machine Work Products? (2020/1) Intellectual Property Quarterly. Available at SSRN: https://ssrn.com/abstract=3498941 or http://dx.doi.org/10.2139/ssrn.3498941; Mauritz Kop, AI & Intellectual Property: Towards an Articulated Public Domain (2019), available at https://ssrn.com/abstract=3409715.
[178] See also McCutcheon (2013A), above note 27, p. 952 (noting that "while the incentive of copyright may be irrelevant to a novelist compelled to write their opus, it may well explain why an expensive computer-generated production is made. Without that reward, the work may not be made ... or disseminated").
[179] Hristov, above note 27, p. 439.

There is a good reason to be sceptical of such arguments – after all, property rights are not the only incentives to create. Investment in AI platforms can be encouraged by factors other than the availability of copyright. Academic and industry respect and recognition, commercial gains through sales of AI programs to other users, and, of course, the human desire and passion to create would still be present – providing AI developers and organisations with incentives to come up with AI technologies.[180] Moreover, in the digital market high demand for instantly consumable media produces a significant first-to-market motivation that materialises independently of copyright being available.[181] Furthermore, as mentioned earlier, the software code which is incorporated in the machine may itself be protected by copyright law (or patent law in some cases),[182] with trade secrets and copyright protection of databases consulted by the programme also being potentially useful.[183]

Nonetheless, there is a genuine concern that if copyright jurists decide that AI works should not be protected - and should instead reside in the public domain - this could encourage (human) dishonesty. Human authors who have used AI technologies to create works may be way of revealing this for fear that to do so would make the resulting works unprotectable. Surely, the law should not encourage dishonesty?

This not a hypothetical problem. Robert Plotkin narrates how a team of computer scientists and musicians from University College London developed a music composition machine that composed music based on an automated assessment of Top 10 tracks; yet, the role of the machine was kept confidential as the music label that invested in the project did not want to disclose that its songs had in fact been written by a machine and not by human musicians. The label was so keen in keeping the involvement of the machine confidential that it even staged meetings with human composers allowing them to act as copyright holders, receiving royalties. [184] An increased in dishonest practices seems inevitable if AI works remain unprotectable. Further to this, there is no doubt that corporate entities will argue in favour of

[180] Hedrick, above note 22, p. 350 (casting doubts on whether these factors are really determinant).
[181] Yu, above note 27, p. 1264 (adding that "because most websites generate revenue through advertisement, website traffic—the total number of visitors to a website—becomes the primary metric of economic success").
[182] Raquel Acosta, Artificial Intelligence and Authorship Rights, 17 February 2012, available at http://jolt.law.harvard.edu/digest/artificial-intelligence-and-authorship-rights (noting that if AI programmers come up with 'some sort of novel invention in the creation of the program, such as developing a predictive algorithm that allows a two dimensional image to be easily converted to a 3D image, they may apply for patent protection of that algorithm'). See also Jean-Marc Deltorn and Franck Macrez, Authorship in the Age of Machine learning and Artificial Intelligence (2018) Centre for International Intellectual Property Studies (CEIPI) Research Paper No. 2018-10.
[183] Ginsburg and Budiardjo, above note 27, p. 455; McCutcheon (2013), above note 25, p. 49.
[184] Robert Plotkin, The Genie in the Machine – How Computer-Automated Inventing is Revolutionizing Law & Business (2009 Stanford Law Books), pp. 83-84.

(at the judicial level) and lobby for (at the legislative level) some form of exclusive rights over AI-produced outputs. For this reason it is worth evaluating whether rather than giving full protection to such works, there may be a justification for awarding a more limited type of protection.

2. A *sui generis* right for works created via algorithmic creativity?

We have seen that at present copyright regimes may not be fit to accommodate what is produced by algorithmic creativity; indeed copyright laws in several jurisdictions do not explicitly protect machine created works. The lack of human authorship/originality is a key factor in this regard. Yet, whether we agree or not, it is inevitable that corporate entities will lobby for a form of exclusive rights to protect the final outputs of machine-driven processes. Could an acceptable compromise be offered by a *sui generis* system – a kind of protection that could incentivise the development of and use of AI creative platforms while at the same time safeguarding human ingenuity?[185] The benefit to a *sui generis* regime (as opposed to using the full scope of copyright to protect such works) would be that right-holders could be given only a thin scope of protection, allowing them to prevent others from exploiting exact copies of the machine generated work. In this view, it would essentially be protection against literal copying only.[186] As to the length of protection, unlike the typical copyright duration, a very short duration could be applied in the AI context e.g. 3 years from the date of publication of the work (the length of term suggested in a recent AIPPI 'Study Question' by Dutch delegates).[187]

Why should a thinner and shorter right be preferred?[188] The usual justifications for the long

[185] Anne Lauber-Rönsberg and Sven Hetmank, The Concept of Authorship under Pressure: Does Artificial Intelligence Shift Paradigms? (2019) Journal of Intellectual Property Law & Practice, p. 577. See also Saiz García, 'Las obras creadas por sistemas de inteligencia artificial y su protección por derecho de autor' (2019) InDret, Revista para el análisis del derecho; Ramalho, above note 25, pp.16-20 (proposing to adopt a (i) regime similar to the EU database right under the EU Database Directive (Directive 1996/9), that notoriously aims at protecting investments made in producing compilation of data; or (ii) a sort of "disseminator's right" comparable to the publisher's right in the publication of previously unpublished works provided by the EU Term of Protection Directive (Directive 93/98), replaced by Directive 2006/116). The second proposal is more concerned with enhancing the accessibility of AI produced content: while such right would be inherently economic, it would allow the right holder to extract value out of the creations and at the same time aim at encouraging the dissemination of algorithmic output. For academic opinions against *sui generis* systems of protection of AI-generated outputs see Patrick Goold, Artificial Authors? Copyright in Works of Machine Learning: A Call to Orthodoxy (2020 draft paper on file with the authors).

[186] For a proposal attributing a thin scope of protection to programmers, see also Yu, above note 25, pp. 1268-1269.

[187] AIPPI Summary Report – 2019 Study Question on Copyright/Data Copyright in Artificially Generated Works, p. 17 (available at https://aippi.org/wp-content/uploads/2019/08/SummaryReport_COPYRIGHT-DATA_London2019_final_160719.pdf).

[188] Section 12(7) of the CDPA states that copyright in computer generated works 'expires at the end of the period of 50 years from the end of the calendar year in which the work was made'.

duration in the context of human authors would not apply. In fact, providing AI developers and companies incentives for AI-created works by offering the strong traditional copyright protection/duration may even lead to fewer human generated works being created in the long run.[189] AI creative capacity is potentially both more vast and speedier than human capacity.[190] The risk is a devaluation of human intellectual ingenuity and a marginalization of the human creative potential.[191] Just as automation threatens (and, over time, eliminates) existing jobs in manufacturing, AI creativity could threaten the value of human authorship.

The provision of a limited *sui generis* right might neutralise this risk by providing an incentive to recognise the creativity of AI works without giving machines an equal level of protection to humans.[192] The fact that only literal copying would be prohibited would leave human creators free to adapt, transform and reinterpret AI generated works and thus to use them for creative purposes. In fact, such a feature of the proposed *sui generis* right may fit with the characteristics of many AI machines such as Amper, an AI music composition system.[193]

With regard to AI consumption, the thin *sui generis* right may be coupled with interpreting the relevant fair use (US) or fair dealing (UK) rules governing the internal processes of algorithmic creation in line with what we discussed earlier in this article).[194] Overall it is arguable that the introduction of a thin and time-limited right – backed up by fair use or fair dealing provisions – could achieve an appropriate balance: while some incentives would still be given to the developers of AI creative technologies via the offer of exclusive rights aimed at preventing the exploitation of the final output by third parties, the reduced scope and duration of the protection

[189] Gervais, above note 17, p. 9. On intrinsic motivations as factors which stimulate creativity, see Christopher Buccafusco and Christopher Sprigman, Experiments in Intellectual Property, in Peter Menell and David Schwartz (eds) Research Handbook on the Economics of Intellectual Property Law (2016).
[190] AIPPI Summary Report, above note 196, pp. 7-8 (French Group position).
[191] AIPPI Summary Report, above note 196, p. 13 (UK Group position).
[192] See again AIPPI Summary Report, above note 196, p. 17 (German Group) (noting that a shorter term of protection is justified in light of "the reduction in costs by using the AI in generating the works … to safeguard the rights of traditional authors from being replaced by the cheaper labour of AI").
[193] Grubow, above note 16, p. 416.
[194] See also Sobel, above note 27, pp. 44-45, proposing the introduction of levies on machine learning to compensate copyright owners and in general human creators, for example, by channeling the proceeds of the levy to artistry charities (it may be argued that a similar system could also be engineered in the context of a sui generis right). In exchange for a levy system, Sobel moreover argues in his article, AI companies and individuals could be exempted by law from any liability for copyright infringement, which would guarantee the future of these technologies. Sobel further notes that the judiciary could also award owners of copyright over the source material compensation on a case-by-case basis, without however allowing them to obtain injunctions aimed at stopping expressive machine learning. The idea of charging AI systems a fee to compensate creators of works that have been fed into creative machines is not new. A compulsory licence fee to be paid to AI creators was proposed in 1994 by Vigderson, above note 27, p. 431. See also the more recent 2017 draft report to the European Parliament's Commission on Civil Law Rules on Robotics (rapporteur Mady Delvaux), which highlighted "the possible need to introduce corporate reporting requirements on the extent and proportion of the contribution of robotics and AI to the economic results of a company for the purpose of taxation and social security contributions".

will leave human creators with enough freedom and motivation to create. Such a balance would preserve value in human ingenuity (fully protectable by copyright) and at the same time sufficiently protect machine produced outputs (and thus encourage investments in and use of AI technologies).[195]

What would the requirement for attracting the *sui generis* protection be? An originality test as assessed and interpreted objectively and contextually would be appropriate.[196] As discussed earlier, judges could consider the work's aesthetic, literary or artistic similarity to existing works when considering originality, in the sense of being sufficiently distinguishable from prior works. While this would necessarily differentiate the originality standards between human created works and AI works it is worth noting that the requirements for attracting protection can vary even under existing laws. Under UK law, for example, while graphic works, photographs, sculptures and collages attract copyright based on originality 'irrespective of artistic quality', other fruits of human creativity like works of artistic craftsmanship are protected only if they reach a certain threshold.[197]

Who would the owner of such a *sui generis* right be? The UK AIPPI Group identifies two alternative approaches i.e. the *proximity* and the *investment* approaches.[198] By using the former criteria the owner could be: (i) the natural or legal person that is most closely associated with the creative output - for example the person who comes up with the code (coder); or (ii) the person who identifies the objective to be reached (goal selector); or (iii) the person who chooses the input data (data selector); or (iv) the person who trains the AI (trainer); or (v) the person who carries out a qualitative or aesthetic selection of a work from a number of new artificially generated works (output selector).[199] Unsurprisingly the UK Group of AIPPI favours the *investment* approach on the basis of legal certainty, thus clearly arguing for corporate ownership i.e. that the natural or legal person who invests in the project should be considered the owner of the *sui generis* right.[200]

[195] AIPPI Summary Report, above note 196, p. 13 (UK Group position).
[196] AIPPI Summary Report, above note 196, p. 16 (UK and Singapore Groups position).
[197] Section 4(1) CDPA.
[198] AIPPI Summary Report, above note 196, pp. 16-17 (UK Group position).
[199] AIPPI Summary Report, above note 196, pp. 16-17 (UK Group position).
[200] AIPPI Summary Report, above note 196, pp. 16-17 (UK Group position). Finally, no moral rights should follow the introduction of this sui generis form of protection. After all, UK copyright law currently excludes the applicability of moral rights to computer generated works: see above notes 71 and 72. On the inappropriateness of the *proximity* approach when it comes to attributing copyright in AI-generated artworks, see also Megan Svedman, Megan, Artificial Creativity: A Case Against Copyright for AI-Created Visual Artwork (2020/1) IP Theory, p. 5.

EU law supports this. The EU Info-Society Directive in Recital 5 recognises that '[t]echnological development has multiplied and diversified the vectors for creation, production and exploitation. While no new concepts for the protection of intellectual property are needed, the current law on copyright and *related rights* should be adapted and supplemented to respond adequately to economic realities' (emphasis added). Recital 5 mentions 'related rights' as referring to rights protecting outputs such as cinematographic works, sound recordings and broadcasts. A sui generis right protecting AI-created works might fit well into the 'related right' category of rights that aim at incentivising investments in crucially relevant technological fields.[201]

There are of course arguments that caution against the introduction of a *sui generis* system. Creating *sui generis* laws to accommodate the needs of a certain sector or industry fails to keep copyright regimes technology-neutral.[202] Yet, it could be counter-argued that copyright laws bring with them the seed of 'differentiation'. These laws have produced across the decades different rules in relation to different works. For example, the range of copyright works are quite distinct from each other, from literary, artistic and musical works to more entrepreneurial (and investment-driven) kinds of subject matters including typographical arrangements of published editions, original compilations of data and sound recordings, broadcasts and movies.

Perhaps the greatest concern with the enactment of a new right would be the danger of increased corporate ownership. This is undoubtedly a worry. However, the recent Shenzhen case demonstrates that in the absence of a thin *sui generis* right, corporate entities will attempt to claim the full rights of copyright over AI created works. Thus, even if there are risks attached to a *sui generis* system, if it is enacted in a balanced way the risk of ending up consolidating and overprotecting monopolistic rent-seeking power may be significantly reduced, if not completely ruled out.

CONCLUSION

[201] See also Toby Bond and Sarah Blair, Artificial Intelligence & Copyright: Section 9(3) or Authorship Without an Author (2019) Journal of Intellectual Property Law & Practice (noting that the solution may lie in recognizing computer created works as deserving of only economic rights similar to those offered to movies, broadcasts, sound recordings and typographical arrangements). After all, a sui generis approach had been advocated by Karl Milde back in 1969: see Milde, above note 25, p. 402 (stressing "the necessity of a new type of protection, sui generis to the problem of computer talk, which would also make practical the enforcement of any right granted").
[202] Florian De Rouck, Moral Rights & AI Environments: the Unique Bond between Intelligent Agents and their Creations (2019) 14/4 Journal of Intellectual Property Law & Practice, p. 203.

It is true that there is a person 'behind every robot'[203] because machines are created, programmed and directed by human beings. Yet, there is also little doubt that nowadays art, music, literature and movies, amongst other outputs, are being generated semi-autonomously by machines without relevant human choices being made over the final works. As the technology progresses further, the direct role of human beings in algorithmic creativity is likely to become more and more distant. Awarding copyright ownership to such humans – e.g. via Section 9(3) – seems less justifiable the more remote the human intervention becomes.

At the same time, we acknowledge that machines should not be considered authors/owners in their own right; aside from the complexities of agency that arise if authorial rights are given to non-humans, the simple fact is that machines need no incentives/rewards to create.[204] Computers produce works for one reason - they are devised and programmed to execute certain functions and trained accurately when to do so.[205] Machines do not get tired, do not crave about maximum hour or minimum wage protection, and can concentrate incessantly on their tasks, no matter how complicated or tedious.[206] What it takes to make these machines or robots work is just electricity,[207] wires, various electronic devices and Internet connection.[208]

Nonetheless, as the kinds of works produced by AI increasingly resemble works traditionally made by humans, there will inevitably be claims by corporate actors that the machine generated outputs should be considered protected by copyright (and owned by corporate actors). We caution against this development, while also acknowledging it may be inevitable that some form of protection is required. Even scholars that are sceptical about extending copyright to AI produced outputs believe that if a machine is capable – for example – to write fiction that it is interesting enough to capture audiences willing to pay, it would be logical for the programmer, owner or user of such machine to attempt to protect such value, not only via technological measures or contractual provisions, but also through copyright law.[209] Indeed, it would be odd if these works were left unprotected (and in the public domain) as this would bring about an

[203] Miller, above note 27, p. 1045.
[204] Carys Craig and Ian Kerr, The Death of the AI Author (2019), copy on file with authors.
[205] Miller, above note 27, p. 1066. Yet, see also Grimmelmann (2016A), above note 25, p. 414 (arguing against computer authorship in the immediate future, but acknowledging that 'it is possible that some future computer programs could qualify as authors. We could well have artificial intelligences that are responsive to incentives, unpredictable enough that we can't simply tell them what to do, and that have attributes of personality that make us willing to regard them as copyright owners').
[206] Liza Vertinsky and Todd Rice, Thinking about Thinking Machines – Implications of Machine Inventors for Patent Law (2002) 8/2 Boston University Journal of Science & Technology Law, p. 578.
[207] Samuelson, above note 17, p. 1199.
[208] Yanisky-Ravid, above note 19, p. 702.
[209] Gervais, above note 17, p. 7.

absurd result: a very simple and banal stick man sketched by a human hand in just a few seconds would be more worthy of protection than a sophisticated machine created painting such as the *Next Rembrandt* or the *Portrait of Edmond Belamy*.[210]

So, what kind of protection should be offered to the fruits of algorithmic creativity? We have demonstrated that copyright regimes - for example in the UK, US, Australia and under EU law - might not be the best fit. Indeed, considering AI generated output as copyright may require overstretching and rethinking important rules and principles, such as the authorship and originality requirement, which are at the core of copyright systems and are still anchored to romantic views focused on the centrality of the human author. The traditional copyright system may not be adequate for another reason: the long duration awarded to works of human authorship.

A *sui generis* right might therefore be an acceptable solution i.e. a system which could strike a fair balance between the need to incentivise the creation of these technologies (through the offer of exclusive rights aimed at maximising the profits out of the final works) and the need to guarantee that human-made creativity continues to thrive despite machines' competition. The scope of protection given by the *sui generis* right should be thin, and backed up by a strict fair use/fair dealing doctrine, and its duration would be very short (e.g. 3 years).

Lastly, there is no doubt that protecting AI generated works will shift the focus from the subjective element of traditional creative processes (the centrality of the human author) to the objective outputs produced by machines, thus changing the emphasis from *authors* to *works*.[211] Yet, as mentioned, the negative effects of such shift (in terms of a progressive marginalisation of human ingenuity) could be contained, if not almost fully neutralised, if a proper balance between the above needs is found.

[210] Linn, above note 27, p. 839. See also Dornis, above note 25, p. 8 (noting that 'subject matter of even minuscule creativity (such as works of simple handcraft) has been promoted to the status of full copyright protection throughout the world. Meanwhile, the copyright protection of AI-generated works remains virtually unattainable due to that fact that *human* creativity is indispensable for such protection').

[211] Denicola, above note 27, p. 270. See also de Cock Buning, above note 25 (noting that 'if courts no longer assess the author, but rather the work he created, regardless of the process by which he came by it, the result of machine creativity could be compared to the result of human creativity objectively, without "prejudice"'.