Do Androids Dream of Electric Copyright? Comparative analysis of originality in artificial intelligence generated works

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1. Introduction

On April 5 2016, an important event in the history of artificial intelligence (AI) took place. A group of museums and research institutions in the Netherlands, in conjunction with Microsoft, unveiled a portrait entitled "The Next Rembrandt".[1] This is not a newly found painting by Rembrandt Harmenszoon van Rijn, nor it is an imitation as such. What makes this portrait unique is that it is presented as a new painting that could have been created by Rembrandt, as it was generated by a computer after painstakingly analysing hundreds of artworks by the Dutch Golden Age artist. The machine used something called "machine learning"[2] to analyse technical and aesthetic elements in Rembrandt's works, including lighting, colouration, brushstrokes, and geometric patterns. The result is a painting where algorithms have produced a portrait based on the styles and motifs found in Rembrandt's art.

One could argue the artistic value of this endeavour,[3] but the technical achievement is ground-breaking. The researchers took in every Rembrandt painting pixel by pixel, and most of the decisions of what would make the final painting were made by the machine itself using pre-determined algorithms. In other words, this represents a computer's interpretation of what a typical Rembrandt painting should look like.

It may seem like this is just another technical advance in a long line of computer-generated art, but what is really happening under the hood of artistic projects such as *The Next Rembrandt* displays a quantum leap in the way that we use machines. We are getting to the point at which vital creative decisions are not made by humans, rather they are the expression of a computer learning by itself based on a set of parameters pre-determined by programmers.

It is fair to point out that *The Next Rembrandt* has not been the subject of any legal scrutiny as of yet. As far as we can tell, the programming team has not made any copyright claims over the painting; it is a project created as an advertisement of the technological capacities that gave rise to it, as it is funded and supported by commercial sponsors. Rembrandt's paintings are in the public domain, and there is likely not going to be any legal opposition to the project, or we are not likely to see this as a violation of moral rights. We are neither likely to revisit questions of originality in the copies of public domain works that were explored in *Bridegman v Corel*.[4] However, the project raises other interesting legal questions. Does this painting have copyright

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on its own right? If so, who owns it? If this project was based on the works of a living artist, could he or she object to the treatment in some manner? Would it be copyright infringement?

This article will try to look at the first questions, namely the issue of whether computer-generated works have copyright protection. While the law about this type of creative work is answered satisfactorily in the UK, the treatment of such works is less clear in other jurisdictions, and there is still debate as to whether some computer works even have copyright in the first place. This article will make a comparative analysis of the law in the UK, Europe, Australia and the US. This is becoming an important area of copyright, and one that has not been explored in depth in the literature.

2. Artificial intelligence and the law

2.1 Artificial Intelligence and machine learning

When we hear the term "artificial intelligence", it is easy to think of it as a futuristic topic, and often the first image that comes to mind one of science fiction depictions of AI, either the human-like friendly android, or the killer robot. But if we understand artificial intelligence as "the study of agents that exist in an environment and perceive and act",[5] it is possible to appreciate that this is a much broader area of study, and we already have various applications used in everyday life that meet the threshold of what is artificial intelligence. From search engine algorithms to predictive text in mobile phones, we are constantly interacting with AI.

Of particular interest to the present article is the application of artificial intelligence in creative works such as art, computer games, film, and literature. There is a short but vibrant history of computer-generated art that takes advantage of different variations of AI algorithms to produce a work of art. The first military-grade computers were able to produce crude works of art, but these first efforts relied heavily on the input of the programmer.[6] During the 1970s, a new generation of programs that were more autonomous started making an appearance, with AARON, a project by artist Harold Cohen becoming one of the longest-running examples of the genre.[7] Later projects, such as e-David, made use of robot arms with real canvas and real colouring palettes.[8] The techniques used in some of these "computer artists" vary from project to project, and while the aspiration of many of these is to be "taken seriously […] as a creative artist",[9] most projects work either copying existing pictures, or almost directly guided by their programmers.

In the textual realm, renowned futurist Ray Kurzweil was granted a patent in the United States for "poet personalities",[10] protecting a method of generating an artificial poet capable of reading a poetry work, analysing the structure, and coming up with its own outputs. Kurzweil went to design a poet called Ray Kurzweil's Cybernetic Poet (RKCP), which reads an extensive selection of poems from an author, and then uses a type of neural network algorithm to produce recursive poetry that can "achieve the language style, rhythm patterns, and poem structure of the original authors".[11] The RKCP programme produced a series of poems, the quality of which

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[5] S. J. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach* (Pearson, 3rd edn, 2010), 1.
[6] B. Edwards, 'The Never-Before-Told Story of the World's First Computer Art (It's a Sexy Dame)' (January 24, 2013) *The Atlantic*.
[7] H. Cohen, 'Parallel to Perception', (1973) 4 *Computer Studies in The Humanities and Verbal Behavior* 37.
[8] O. Deussen, T. Lindemeier, S. Pirk, M. Tautzenberger, 'Feedback-guided Stroke Placement for a Painting Machine' (2012) in *Proceedings of the Computational Aesthetics in Graphics Conference, 2012*.
[9] These are the words of The Painting Fool, an art project by Simon Colton, see: http://www.thepaintingfool.com/.
[10] US Patent 6,647,395.
[11] R. Kurzweil, *The Age of Spiritual Machines: How We Will Live, Work and Think in the New Age of Intelligent Machines* (Texere 2001), at 117.

is debatable. However, this resulting haiku may prove evocative regarding the subject matter of the current article:

> *"The stifling stuffy*
> *Catholic schoolroom,*
> *where I cannot be real."[12]*

While interesting from an artistic and technical perspective, all of the above examples of computer art and literature rely heavily on the programmer's input and creativity. But the next generation of artificial intelligence artists are based on entirely different advances that make the machine act more independently, sometimes even making autonomous creative decisions. The field of machine learning is a subset of artificial intelligence that studies autonomous systems that are capable of learning without being specifically programmed.[13] The computer programme has a built-in algorithm that allows it to learn from data input, evolving and making future decisions in ways that can be either directed, or independent.[14] There are various techniques that fall under the category of machine learning,[15] but for the purpose of this article, we will concentrate on those which show potential for creative works.

One of the most exciting innovations in machine learning art comes in the shape of what is known as an artificial neural network, an artificial intelligence approach based on biological neural networks that use neuron equivalents based on mathematical models.[16] One such application in art is a Google project called Deep Dream,[17] a visualization tool that uses neural networks to create unique, bizarre, and sometimes unsettling images.[18] Deep Dream transforms a pre-existing image using machine learning mathematical methods that resemble biological neural networks, in other words, the machine mimics human thinking and makes a decision as to how to transform the input based on pre-determined algorithm. What is novel about Deep Dream, and other similar applications of neural networks, is that the program decides what to amplify in the image modification, so the result is unpredictable, but also it is a direct result of a decision made by the algorithm. The researchers explain:

> *"Instead of exactly prescribing which feature we want the network to*
> *amplify, we can also let the network make that decision. In this case we*
> *simply feed the network an arbitrary image or photo and let the network*
> *analyze the picture. We then pick a layer and ask the network to enhance*
> *whatever it detected. Each layer of the network deals with features at a*
> *different level of abstraction, so the complexity of features we generate*
> *depends on which layer we choose to enhance."[19]*

The result of different levels of abstraction produce new images that do not resemble the originals, but most importantly, they are not the result of creative decisions by the programmers, but rather they are produced by the program itself.

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[12] Ibid, at 119.

[13] J. G. Carbonell, R. S. Michalski, and T. M. Mitchell, *Machine Learning: An Artificial Intelligence Approach* (Tioga Publishing 1983), 4.

[14] Michie, D., Spiegelhalter, D. J., & Taylor, C. C. Machine learning, neural and statistical classification (Springer 1994).

[15] P. Langley, 'The Changing Science of Machine Learning' (2011) 82 *Machine Learning* 275.

[16] M. M. Nelson and W. T. Illingworth, *A Practical Guide to Neural Nets* (Addison-Wesley 1991), 13.

[17] A. Mordvintsev, 'Inceptionism: Going Deeper into Neural Networks' (June 17, 2015) *Google Blog*, https://research.googleblog.com/2015/07/deepdream-code-example-for-visualizing.html.

[18] A collection of Deep Dream images: http://deepdreamgenerator.com/gallery/public/best-dreams.

[19] Mordvintsev, n 17 above.

Deep Mind, the Google company dedicated to the exploration of machine learning, has been publishing large number of papers explaining the various experiences with artificial agents engaged in the development of art and music.[20] While Deep Dream has been widely publicised in the mainstream media, one of the most astounding projects involves music, and it is called WaveNet.[21] This is a project that was initially created to generate seamless artificial voice audio by using a machine learning algorithm that replicates how voices sound in real life, which tries to get past the mechanical sound when computers speak. What is interesting is that by analysing voice waves, Wavenet has learned also how to create music. When given a set of classical music to analyse, Wavenet produced completely generative piano compositions that would not be amiss in a sophisticated piano concerto, and that has been generated solely by the machine.[22] The technology is reaching a point where it might be difficult to tell a real composer from an automated agent.

Another relevant application of machine learning algorithms can be found in game development. There are already considerable applications of artificial intelligence in gaming,[23] but one of the most innovative is what is known as procedural generation, a method of creating content algorithmically.[24] The promise of this type of development is to have gaming environments created not by the programmers, but that the program itself based on pre-determined rules and algorithms. The potential is to have games with no end, where content is generated by the computer in a unique manner each time that the player logs in. This is already a reality in the blockbuster game *No Man's Sky*, where the program makes "mathematical rules that will determine the age and arrangement of virtual stars, the clustering of asteroid belts and moons and planets, the physics of gravity, the arc of orbits, the density and composition of atmospheres".[25] While the programmers set parameters, the machine literally builds new virtual worlds every time it runs.

We are about to encounter more and more artistic implementations of artificial intelligence using various machine learning methods, and examples already abound, including music,[26] movie scripts,[27] and art installations.[28] The common thread running through all of these applications is that most of the creative choices are no longer made programmers, and a large part of what we generally would define as the creative spark comes from the machine.

2.2. Framing the issue of machine learning and copyright

In the past few decades there has been growing interest in the legal applications of artificial intelligence. For the most part, the literature covers the use of artificial intelligence in legal systems as an aid to decision making,[29] but there has been growing interest of the practical

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[20] See: https://deepmind.com/research/publications/.

[21] A. van den Oord et al, 'Wavenet: A Generative Model for Raw Audio' (2016), *arXiv* 1609.03499v2, https://arxiv.org/pdf/1609.03499.pdf.

[22] Several samples can be found here: https://deepmind.com/blog/wavenet-generative-model-raw-audio/.

[23] D. Kehoe, *Designing Artificial Intelligence for Games* (2009) Intel Developer Zone Papers, https://software.intel.com/en-us/articles/designing-artificial-intelligence-for-games-part-1.

[24] D. Ashlock, C. Lee, and C. McGuinness, 'Search-based procedural generation of maze-like levels' (2011) 3(3) *IEEE Transactions on Computational Intelligence and AI in Games* 260, at 264.

[25] R. Khatchadourian, 'World without end: creating a full-scale digital cosmos' (2015) 91 *The New Yorker* 48.

[26] See various projects here: http://www.datasciencecentral.com/profiles/blogs/using-machine-learning-to-generate-music.

[27] A. Newitz, 'Movie written by AI algorithm turns out to be hilarious and intense' (June 16, 2016) *Ars Technica*, http://bit.ly/29QXzcu.

[28] G. Kogan, 'Machine learning for artists' (January 5, 2016) *Medium*, http://bit.ly/29QXWDS.

[29] See: J. Bing and T. Harvold, *Legal Decisions and Information Systems* (Universitetsforlaget; Henley on Thames 1977); G. Sartor, *Artificial Intelligence and Law: Legal Philosophy and Legal Theory* (Tano 1993); P. Leith, *Formalism in Al and Computer Science* (Ellis Horwood 1990); and D. Bourcier, L. Bochereau and P. Bourgine,

implications of the wider availability and implementation of intelligent systems in everyday life.[30] Machine learning itself has also started getting some attention in legal informatics as a method to index legal cases,[31] and also to make legal arguments based on data inputs.[32] Some algorithms are also drafting patent applications,[33] and even have been used to pre-empt state of the art in future inventions.[34]

All of these are often ground-breaking and innovative areas of research, but they tend to be a very specialist area of study that generally eludes the mainstream. Even the most popular works that propose some form of legal adoption of artificial intelligence in the legal profession[35] can often be received with mild scepticism about the true reach of the potential for change.[36]

But an aspect of machine learning has been generally neglected, with a few notable exceptions cited throughout this work, and it is that it may prompt us to revisit the concepts of originality and creativity that rest at the heart of copyright protection. There is a common element in most of the examples of machine learning that have been described in the previous section, and it is that we have machines that are starting to generate truly creative works, prompting us to review our understanding of originality.

Intellectual property is specifically directed towards the protection of the fruits of the human mind, and these works are given a set of limited ownership rights allocated to persons, both natural and legal.[37] Because of the personal nature of this type of protection, there is no such thing as non-human intellectual property rights.

Copyright law clearly defines the author of a work as "the person who created it".[38] Despite some recent legal disputes regarding monkeys and photographs,[39] it is highly unlikely that we will witness any deviation away from personhood as a requirement for ownership, and we are not to witness any sort of allocation of rights towards machines and animals. However, works like *The Next Rembrandt* could challenge what we generally consider to be original, which is one of the requirements for copyright protection.[40] Is the mechanistic data analysis of dozens of portraits enough to warrant protection? Is there originality in the composition of the program? What if most of the creative decisions are being performed by the machine?

"Extracting legal knowledge by means of multilayer neural network. Application to municipal jurisprudence", in *Proceedings of the 3rd ICAIL*, Oxford (ACM 1991), 288.

[30] For a couple of examples, see: B. Berendt and S. Preibusch, 'Better Decision Support through Exploratory Discrimination-Aware Data Mining: Foundations and Empirical Evidence' 22 *Artificial Intelligence and Law* 175; and M. Wagner, 'The Dehumanization of International Humanitarian Law: Legal, Ethical, and Political Implications of Autonomous Weapon Systems' (2014) 47 *Vanderbilt Journal of Transnational Law*, 1371.

[31] S. Brüninghaus, and K. D. Ashley, 'Toward Adding Knowledge to Learning Algorithms for Indexing Legal Cases' in *ICAIL '99: Proceedings of the 7th International Conference on Artificial Intelligence and Law* (ACM Press 1999), 9.

[32] M. Možina and others, 'Argument Based Machine Learning Applied to Law' 13 *Artificial Intelligence and Law* 53.

[33] B. Hattenbach, and J. Glucoft, 'Patents in an Era of Infinite Monkeys and Artificial Intelligence' (2015) 19 *Stanford Technology Law Review* 32.

[34] This is a project called "All Prior Art", which attempts to algorithmically create and publicly publish all possible new prior art, making it impossible for future inventions to be registered. See: http://allpriorart.com/.

[35] See for example R. E. Susskind and D. Susskind, *The Future of the Professions: How Technology Will Transform the Work of Human Experts* (Oxford University Press 2015).

[36] 'Professor Dr Robot QC' (October 17, 2015) *The Economist*.

[37] E. Hettinger, 'Justifying Intellectual Property' (1989) *18 Philosophy & Public Affairs* 31.

[38] Copyright, Designs and Patents Act 1988, s 9(1).

[39] A. Guadamuz, 'The Monkey Selfie: Copyright Lessons for Originality in Photographs and Internet Jurisdiction' 5 *Internet Policy Review*.

[40] A. Rahmatian, 'Originality in Uk Copyright Law: The Old "Skill and Labour" Doctrine under Pressure' (2013 44 IIC 4.

Interestingly, science fiction depiction of artificial intelligence organisms invariably tries to tackle the question of art and the machine. In various depictions of robots and androids, the understanding of art and music is an important element towards the elevation of the machine towards personhood. A great example of this is Data in *Star Trek: The Next Generation*, who struggles with his search for personhood by painting and performing music. On the other hand, the android Ava in the movie *Ex Machina* uses art to deceive one of the protagonists into thinking that it is more like a human, eventually betraying their trust. Art, music, and literature are quintessentially human, and any effort to allocate creativity to artificial intelligence feels wrong.

But the fact remains that machines are creating art, even if the experts are divided in artistic merit of existing productions.[41] While accepting that it is art, critic Ben Davies comments that Deep Dream "is essentially like a psychedelic Instagram filter".[42] So at the very least, we need to explore from a legal perspective if the new forms of creative works generated by intelligent machines meet the requirements for copyright protection, and if they do, we need to ask who owns the images.

This may seem like a fruitless academic exercise with little practical implications, but there is potential for this becoming an important legal issue. Commercial application of machine learning is already taking place at a broader scale,[43] and this technology is set to become an important tool in many creative industries in the future.[44] A report by Nesta on the potential impact of artificial intelligence in the creative industries found that while highly creative jobs are not at risk, there will be a growing participation of machine learning in the industry. The report states:

> *"In the creative economy, advances in the area of Mobile Robotics may have implications for making and craft activities (as industrial robots with machine vision and high–precision dexterity become cheaper and cheaper). Data Mining and Computational Statistics where algorithms are developed which allow cognitive tasks to be automated – or become data–driven – may conceivably have significant implications for non–routine tasks in jobs as wide–ranging as content."[45]*

This means that while we still have writers, musicians, artists and game designers in charge of the creative process, large number of tasks, particularly mechanical tasks, might be given to machines.

This is not science fiction, there are already plenty of examples of commercially-viable artificial intelligence projects that produce copyright works that sound indistinguishable from those produced by a human. Jukedeck[46] is an interesting example that produces unique music for commercial use in seconds; the user only needs to specify the genre, the mood, and the length of the song, and the site's neural network will produce a royalty-free composition that

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[41] M. Galperina, 'Is Google's Deep Dream art?' (July 14, 2015), *Hopes&Fears*, http://www.hopesandfears.com/hopes/culture/is-this-art/215039-deep-dream-google-art.

[42] Ibid.

[43] R. S. Olson, 'How Machines Learn (And You Win)' (2015), *Harvard Business Review*, http://bit.ly/2a31OlI.

[44] A. J. Champandard, 'Making Designers Obsolete? Evolution in Game Design' (February 6, 2012) *AI GameDev*, http://aigamedev.com/open/interview/evolution-in-cityconquest/.

[45] H. Bakhshi, C. B. Frey, and M. Osborne, *Creativity Vs. Robots: The Creative Economy and the Future of Employment* (NESTA 2015).

[46] https://www.jukedeck.com.

can be incorporated into a video or any other derivative work.[47] Similarly, a Google project used neural networks to produce unsupervised poetry after "reading" 11,000 unpublished books.[48] In a related note, a news organisation has announced that it might deploy a machine learning algorithm to author news items in sport and election coverage.[49]

The issue with examples such as these is that we are entering a new era of creation that allows for increasingly smart programs to produce advanced works that would normally be given copyright protection by the author. Boyden calls these creations "emergent works", and comments that in many instances we are presented with pieces that have emerged from the program itself, and practically without human interaction.[50] Will developments such as these have an effect in ownership? And what happens when machines start making important creative decisions?

Finally, there is another angle to study, and this is the problem of artificial intelligence agents as copyright infringers.[51] While extremely relevant in its own right, this topic falls outside of the remit of the current work, as it deals with the issue of responsibility of autonomous machines, rather than rights allocated to the creations that they produce.

3. Protection of computer-generated works

3.1 Computer-generated works in the UK

The legal ownership of computer-generated works is perhaps deceptively straightforward in the UK. Section 9(3) of the Copyright, Designs and Patents Act (CDPA) states:

> *"In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken."*

Furthermore, s 178 defines a computer-generated work as one that "is generated by computer in circumstances such that there is no human author of the work." This is an elegant and concise wording that does away with most potential debates about the creative works produced by artificial intelligent agents. However, the UK is one of only a few countries protect computer-generated works,[52] most of the others clearly inspired by the UK treatment of computer-generated works, as they use practically the same formulation.[53] In fact, this has been for a

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[47] For an example of a melancholic pop song produced by the site's artificial intelligence, see: http://bit.ly/2athkHE.

[48] S. R. Bowman et al, 'Generating Sentences from a Continuous Space' (2015) arXiv:1511.06349v4, https://arxiv.org/abs/1511.06349.

[49] D. Ponsford, 'Press Association set to use 'robot' reporters across business, sport and elections coverage' (October 18, 2016) *Press Gazzette* http://www.pressgazette.co.uk/press-association-set-to-use-robot-reporters-across-business-sport-and-elections-coverage/.

[50] B. E. Boyden, 'Emergent Works' (2016) 39 *Columbia Journal of Law and the Arts* 377, at 378.

[51] B. Schafer and others, 'A Fourth Law of Robotics? Copyright and the Law and Ethics of Machine Co-Production' 23 *Artificial Intelligence and Law* 217. See also, J. Grimmelman, 'Copyright for Literate Robots' (2016) 101 *Iowa Law Review* 657.

[52] Besides the UK, such protection exists only in Ireland, New Zealand, India, and Hong Kong. See: J. McCutcheon, 'Vanishing Author in Computer-Generated Works: A Critical Analysis of Recent Australian Case Law' (2012) 36 *Melbourne University Law Review* 915, at 956. It is worth pointing out that while McCutcheon also includes South Africa in the list, the definition in the s 1(1)(i) is for a computer programme, not computer-generated work.

[53] For example, the Copyright and Related Rights Act 2000 (Ireland), s 21(f) says that an author in computer-generated works is "the person by whom the arrangements necessary for the creation of the work are undertaken". Almost the same wording can be found in Copyright Act 1994 (New Zealand) s 5(2)(a); Copyright Act 1978 (South Africa) s 1(1)(h); and Copyright Act 1957 (India) s 2(d)(vi).

while considered one of the most salient aspects where UK and Irish copyright law diverges from the European norms,[54] as will be explained in the next section.

The fact that s 9(3) is so clear could explain the lack of case law dealing with this problem. In fact, the main authority in the area of computer-generated works predates the existing law. The case is *Express Newspapers v Liverpool Daily Post*,[55] in which the plaintiffs published a competition involving the distribution of cards to its readers, with each card having a sequence of five letters that were to be checked against the winning sequences published by the Express group newspapers. The winning sequences were published in a grid of five rows and five columns of letters. Because the players did not need to purchase the newspaper in order to obtain the cards, the Liverpool Daily Post reproduced the winning sequences in their newspapers. The plaintiffs sued seeking an injunction against this practice.

The defendants contended that the published sequences were not protected by copyright because they had been generated by a computer, and therefore there was no author. Whitford J held that the computer was merely a tool that produced the sequences using the instructions of a programmer, so the plaintiffs were awarded the injunction. Whitford J commented:

> *"The computer was no more than the tool [...]. It is as unrealistic as it would be to suggest that, if you write your work with a pen, it is the pen which is the author of the work rather than the person who drives the pen."[56]*

This decision is consistent with s 9(3), but despite the apparent clarity of this argument, there is some ambiguity as to who the actual author is. Adrian astutely points out that Whitford J's pen analogy could be used to adjudicate copyright ownership to the user of the program, and not to the programmer.[57] It seems evident that the spirit of the law favours the later and not the former, but this is a persisting ambiguity that could have impact in a world where computer-generated works become more prevalent.

Let us use a word processor to illustrate why the existing ambiguity could prove problematic. It is evident that Microsoft, the makers of the Word programme, do not own every piece of work written with their software. Now imagine a similar argument with a more complex machine learning program such as *No Man's Sky*. If we use the word processor analogy, one would own all new worlds generated by the software because the user made "the arrangements necessary for the creation of the work". Yet clearly the game developers make a strong claim in their end-user licence agreement that they own all intellectual property arising from the game.[58]

It is therefore necessary to seek clarification to this possible conundrum elsewhere. While discussing copyright reform that eventually led to the 1988 CDPA and the current wording of s9(3), the Whitford Committee had already discussed that "the author of the output can be none other than the person, or persons, who devised the instructions and originated the data used to control and condition a computer to produce a particular result."[59]

Similarly, during the discussion of the enactment of the current law, the House of Lords discussed computer-generated in the context of exempting s 9(3) from the application of moral

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[54] C. Handig, 'The copyright term "work" - European harmonisation at an unknown level' (2009) 40 IIC 665, 668.

[55] Express Newspapers Plc v Liverpool Daily Post & Echo Plc [1985] 3 All E.R. 680.

[56] At 1098.

[57] A. Adrian, *Law and Order in Virtual Worlds: Exploring Avatars, Their Ownership and Rights* (Information Science Reference 2010).

[58] http://store.steampowered.com//eula/275850_eula_0.

[59] "Report of the Whitford Committee to Consider the Law on Copyright and Designs" (Cmd 6732, 1977) at para 513.

rights.[60] In that context, Lord Beaverbrook usefully commented that "[m]oral rights are closely concerned with the personal nature of creative effort, and the person by whom the arrangements necessary for the creation of a computer-generated work are undertaken will not himself have made any personal, creative effort."[61] This suggests that the law recognises that there is no creative input in computer-generated works, and therefore s 9(3) has been framed as an exception to the creativity and originality requirements for the subsistence of copyright. It is precisely this divorce with creativity what makes the UK's computer-generated clause so different to other jurisdictions.

Some commentators seem to be concerned about the ambiguity present both in the law and in *Express Newspapers*. Dorotheu goes through the options of who owns a work produced by an artificial intelligent agent, weighing the merits of giving ownership to the programmer, to the user, to the agent itself, or to no one at all.[62] However, this apparent ambiguity could be solved simply by reading the letter of the law and applying it on a case by case basis. If the artificial agent is directly started by the programmer, and it creates a work of art, then the programmer is clearly the author in accordance to s 9(3) CDPA. However, if a user acquires a program capable of producing computer-generated works, and uses it to generate a new work, then ownership would go to the user.

This is already happening with Deep Dream images. After announcing the existence of the Deep Dream project, Google released its code[63] to the public as an open source program,[64] not claiming ownership over any of the resulting art. Any user can run the program and generate art using it, and it would seem counterintuitive to believe that Google should own the images, after all, the user is the one who is making the necessary arrangements for the creation of the work.

To illustrate this approach of looking at works on a case by case basis, we can look at the main case that cites s 9(3) CDPA. In *Nova Productions v Mazooma Games*,[65] the plaintiff designed and sold arcade video games, and they claimed that the defendants produced two games that infringed its copyright. The question was not that any source code had been copied, but that some graphics and frames were very similar between all three works. In first instance Kitchin J found that there was no substantial similarity between the works, and the plaintiffs appealed. Jacob L J opined that individual frames shown on a screen when playing a computer game where computer-generated artistic works, and that the game's programmer "is the person by whom the arrangements necessary for the creation of the works were undertaken and therefore is deemed to be the author by virtue of s.9(3)."[66] Interestingly, Jacob L J also addresses the potential authorship of the user. He comments:

> *"Before leaving this topic there is one further complexity I must consider and that is the effect of player input. The appearance of any particular screen depends to some extent on the way the game is being played. For example, when the rotary knob is turned the cue rotates around the cue ball. Similarly, the power of the shot is affected by the precise moment the player chooses to press the play button. The player is not, however, an author of any of the*

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[60] HL Deb vol 493 col 1305 25 February 1988.

[61] Ibid.

[62] E. Dorotheu, 'Reap the benefits and avoid the legal uncertainty: who owns the creations of artificial intelligence?' (2015) 21 *Computer and Telecommunications Law Review* 85.

[63] https://github.com/google/deepdream.

[64] For more about open source software, see: L. E. Rosen, *Open Source Licensing: Software Freedom and Intellectual Property Law* (Prentice Hall PTR 2004).

[65] Nova Productions Ltd v Mazooma Games Ltd & Ors [2007] EWCA Civ 219.

[66] At 105.

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. Nor has he undertaken any of the arrangements necessary for the creation of the frame images. All he has done is to play the game."[67]

This opens the door to the possibility that only a user who "contributes skill and labour of an artistic kind" could be declared the author of the work.

To summarise, the situation in the UK with regards to computer-generated works would appear to be well covered by the law and case law, and even the potential ambiguities are not problematic. Generally speaking, s 9(3) acts as an exception to the originality requirements in copyright law. But there is a potential spanner in the works, European copyright law has been taking a very different direction with regards to originality, and this could prove to be a clash with regards to the long-term viability of the UK's approach. This divergence is discussed next.

3.2. Originality and creativity in Europe

As it has been covered above, while the law is clear in the UK covering computer-generated works, the situation in the rest of Europe is considerably less favourable towards ownership of computer works. There is no equivalent to s 9(3) in the major continental copyright jurisdictions, and the subject is not covered by the international treaties and the copyright directives that harmonise the subject.[68] Art 5 of Spanish copyright law[69] specifically states that the author of a work is the natural person who creates it; while Art 7 of German copyright law[70] says that the "author is the creator of the work", and while it does not specify that this is to be a person, Art 11 declares that copyright "protects the author in his intellectual and personal relationships to the work", which strongly implies a necessary connection with personhood.

The end result is that computer-generated works are not dealt with directly in most European legislation, so when presented with a work that has been created with a computer, one must revert to the basics of awarding copyright protection, namely originality. For such a vital concept of authorship, originality has proved to be a difficult concept to pin down, while it is well understood that originality is one of the most important elements of authorship, different jurisdictions have developed their own version of originality, and furthermore, the level of originality may vary in one jurisdiction depending on the nature of the work.[71] Indicative of the lack of harmonisation is the fact that Rosati identifies at least four different originality standards in common use.[72]

It is precisely the European standard that could present its own unique challenges to computer-generated works. This standard is to be found in the Court of Justice decision of *Infopaq*,[73] where the Danish news clipping service Infopaq International was taken to court by the Danish newspaper association over its reproduction of news cuttings for sale to its clients. The clipping process involved a data capture process consisting of scanning images of original articles, the translation of those images into text, and the creation of an eleven-word snippet for sale to Infopaq's clients. The court had to determine whether these snippets were original enough, as the process was highly mechanised. The Court decided to define originality as a work that must be the "author's own intellectual creation", and ruled in favour of giving copyright to the work.

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[67] At 106.
[68] Handig, n 54 above at 668.
[69] Ley 22/11 sobre la Propiedad Intelectual de 1987.
[70] *Urheberrechtsgesetz* (UrhG), 1.10.2013.
[71] J. C. Ginsburg, 'The Concept of Authorship in Comparative Copyright Law' (2002) 52 DePaul L. Rev. 1063.
[72] E. Rosati, *Originality in EU Copyright: Full Harmonization through Case Law* (Edward Elgar 2013), at 60.
[73] Case C-5/08 Infopaq International A/S v Danske Dagblades Forening [2009] ECR I-06569.

Dealing specifically with computer-generated works there is further clarification in *Bezpečnostní softwarová asociace*,[74] the CJEU were asked to determine whether a computer graphical interface was a work in accordance to the definitions set out in European copyright law.[75] The court declared that "a graphic user interface can, as a work, be protected by copyright if it is its author's own intellectual creation."[76]

The above make a strong indication about the personal nature of the European originality requirement. As Handig accurately points out, "[t]he expression "author's own intellectual creation" clarifies that a human author is necessary for a copyright work".[77] Moreover, the preamble of the Copyright Term Directive[78] defines original as a work that is the "author's own intellectual creation reflecting his personality". It seems then inescapable to conclude that not only does the author need to be human, the copyright work must reflect the author's personality.

All of the above is not problematic for most computer-generated works, particularly those in which the result is the product of the author's input. When using graphic editing software to produce a picture, the resulting picture will reflect the creative impulses of artists, reflecting their personality. But conversely, it is easy to see how a definition of authorship that is completely embedded to personal creativity would spell trouble for computer-generated works that are the result of an advanced artificial intelligence program. Even the creators of Deep Dream do not know exactly what happens at all stages of the production of an image. They comment that the artificial intelligence is perfectly capable of making its own decisions about what elements to enhance, and this decision is entirely independent of human input.[79]

The decision of whether a machine-generated image will have copyright in Europe under the *Infopaq* standard may come down to a matter of a case-by-case analysis of just how much input comes from the programmer, and how much from the machine. Take the machine learning algorithm used in the creation of *The Next Rembrandt* as an illustration of the challenges ahead. The description[80] of the process that led to the creation of the painting makes it clear that a lot of work was performed by the team of experts and programmers: they identified portraits as the way to go, and then selected using various commonalities in this set, including age, gender, face direction, and lighting. They then decided that the portrait would depict a "Caucasian male, with facial hair, between 30-40 years old, wearing dark clothing with a collar, wearing a hat and facing to the right".[81] With that data selection, they extracted data from portraits that had only those sets of features. The experts allowed an algorithm to select common features in the data set, and the program came with "typical" Rembrandt elements for each part of the portrait.

The question then is whether *The Next Rembrandt* has copyright. Based on just the description of the process found in interviews and online, it is difficult to say that the process does not represent the personality of the authors through the choice of portrait elements to give to the computer to analyse. This is extremely important in the *Infopaq* standard, in that case the CJEU

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[74] Case C-393/09 Bezpečnostní softwarová asociace – Svaz softwarové ochrany (BSA) v Ministry of Culture of the Czech Republic [2010] ECR I-13971.

[75] Specifically, Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society [2001] OJ L167 10.

[76] *Bezpečnostní softwarová asociace,* at 46.

[77] Handig, n 54 above at 668.

[78] Council Directive 93/98/EEC of 29 October 1993 harmonizing the term of protection of copyright and certain related rights [1993] OJ L290 9.

[79] Mordvintsev, n 17 above.

[80] See: https://youtu.be/IuygOYZ1Ngo.

[81] Ibid.

commented that elements by themselves may not have originality, but a selection process could warrant originality. The Court ruled:

> *"Regarding the elements of such works covered by the protection, it should be observed that they consist of words which, considered in isolation, are not as such an intellectual creation of the author who employs them. It is only through the choice, sequence and combination of those words that the author may express his creativity in an original manner and achieve a result which is an intellectual creation."*[82]

Infopaq dealt with words, but the CJEU has extended a similar analysis to other types of work, such as it did with photographs in *Painer v Standard Verlags*,[83] where the preparation phase of taking a photograph, as well as the development choices and even the software editing decisions would be enough to warrant originality as they would reflect the author's "personality and expressing his free and creative choices in the production of that photograph."[84]

At the very least, *The Next Rembrandt* displays enough of that selection process to warrant originality given the current standards. But it is possible that other pictures where most of the decision is made by the computer, particularly in neural networks such as Deep Dream, this selection may not be enough to warrant originality, but this is entirely dependent on each case, and the interpretation given to what constitutes selection.

UK works appear immune from these problems given the relative clarity of s 9(3), but this could be under threat given recent decisions, particularly the landmark case of *Temple Island Collections v New English Teas*.[85] The case involves a black and white image of the UK Parliament building, and a bright red bus travelling across Westminster Bridge. The claimant owned the photograph, which was used in London souvenirs, and the defendant is a tea company that created a similar picture for a publicity campaign. Birss QC had to determine whether the original picture had copyright, and he concluded that when it comes to photography the composition is important, namely the angle of shot, the field of view, and the bringing together of different elements at the right place and the right time are enough to prove skill and labour, and therefore should have copyright.[86] This result was consistent with the skill and labour originality standard that was prevalent in the UK through various cases.[87]

However, throughout *Temple Island Collections* Birss QC seamlessly integrates "skill and labour" with Infopaq's "intellectual creative effort", and through repetition makes them equivalent, and even becoming "skill and labour/intellectual creation".[88] This case, coupled with other developments such as the treatment of originality in databases in the CJEU decision of *Football Dataco v Yahoo! UK*,[89] has prompted Rahmatian to claim that the skill and labour test is under fire.[90] It is now possible to contend that *Infopaq* has been harmonised into UK law.

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[82] *Infopaq*, at 45.

[83] Case C-145/10 Eva-Maria Painer v Standard Verlags GmbH & Others [2010] ECR I-12533.

[84] Painer, at 94.

[85] Temple Island Collections Ltd v New English Teas Ltd and Another (No. 2) [2012] EWPCC 1.

[86] At 68-70.

[87] See for example, University of London Press v University Tutorial [1916] 2 Ch 601 adn Interlego A.G v Tyco Industries Inc & Ors (Hong Kong) [1988] 3 All ER 949. For a description of this see:

[88] At 27. Various other examples can be found at 31 and 34.

[89] Case C‑604/10, Football Dataco Ltd and Others v Yahoo! UK Ltd and Others [2012] WLR(D) 57.

[90] Rahmatian, n 40 above. See also A. Rahmatian, 'Temple Island Collections v New English Teas: an incorrect decision based on the right law?' (2012) 34 European Intellectual Property Review 796.

If we take as a given that the UK now has a more personal test that requires us to analyse the author's own intellectual creation reflecting his personality, then we could argue that artificial intelligence works where the author has less input could be under fire in the future, particularly if we can expect further harmonisation, which is difficult to ascertain given the troubled interaction with the EU at the time of writing.

Assuming that nothing changes and s 9(3) remains the undisputed standard for computer-generated works, it is now time to look at how other jurisdiction deal with artificial intelligence and computer generated works.

3.3 Protection in other jurisdictions

As we have seen above, there are several common law countries that have implemented some form of protection for computer-generated works, while continental traditions of copyright protection tend to place the emphasis of authorship on personality and the creative effort. There is a third group of countries that deal with authorship in ways that make it difficult to protect computer-generated works, and these are Australia and the United States.

3.3.1 United States

United States copyright has been dealing with originality and authorship in a manner that deviates from other jurisdictions, what Gervais and Judge call "silos of originality"[91] where various approaches have arisen. The US standard is set by *Feist Publications v. Rural Telephone Service*,[92] where the US Supreme Court had to decide on the originality of a phone directory containing names, towns and telephone listings. Feist Publications copied over four thousand entries from a "white pages" directory compiled by Rural Telephone Service, and they did so without a licence. The prevalent principle before this decision was a "sweat of the brow" approach that allowed the copyright of a compilation of facts if enough effort had gone into the creation of the compilation, even if facts are not protected by copyright.[93] The Court famously commented that "100 uncopyrightable facts do not magically change their status when gathered together in one place".[94] Copyright protection therefore will only be given to "those components of a work that are original to the author",[95] giving rise to a standard that requires "a modicum of creativity".[96] This test stands in stark contrast to the *Inofopaq* standard prevalent in Europe, as in *Feist* the Supreme Court clearly reckons that selection, coordination and arrangement of information is not an act that conveys originality, while the opposite is true across the Atlantic.[97]

It is easy to see that under this standard, some computer-generated works would not be protected, particularly if we are witnessing a work created with advanced artificial intelligence where a human author may not lend originality to the work. In fact, Feist specifically seems to veer against granting "mechanical or routine" acts with originality,[98] and can there be anything more mechanical than a machine that produces a work?

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[91] E. F. Judge, and D. Gervais, 'Of silos and constellations: Comparing notions of originality in copyright law' (2009) 27 *Cardozo Arts and Entertainment Law Journal* 375.

[92] Feist Publications, Inc. v. Rural Telephone Service Co., 499 U.S. 340 (1991).

[93] J. C. Ginsburg, 'No "Sweat"? Copyright and Other Protection of Works of Information after Feist v. Rural Telephone' (1992) 92 *Columbia Law Review* 338.

[94] Feist, at 1287.

[95] Ibid, at 1289.

[96] Ibid, at 1288.

[97] R. VerSteeg, 'Rethinking Originality' (1993) 34 *William & Mary Law Review* 802, at 821.

[98] Feist, at 1296.

Before *Feist*, the main treatment of the subject was undertaken in the 1979 report by the US Congress National Commission on New Technological Uses of Copyrighted Works (CONTU),[99] which decided not to give any special treatment to computer-generated works because no insurmountable problems were apparent or foreseeable. Because this was pre-*Feist*, CONTU's approach was to allocate copyright protection for computer-generated works using the 'sweat of the brow' approach, which seemed sensible at the time, something that several commentators agreed with.[100]

Other analysts were not as content with the CONTU approach, and veered towards a more proactive way to protect artificial intelligence works. In an article well ahead of its time,[101] Butler opined that "[i]n the vast majority of programming situations the legal requirements of human authorship can be easily satisfied."[102] However, he conceded that there could be a problem with advances in artificial intelligence that would cross what he defined as the man/machine threshold;[103] this is when a work can be said to have been authored by a machine and not by the programmer. Butler then goes on to suggest that copyright law pertaining to authorship should be interpreted with a "human presumption",[104] if a work has been created by a machine in a way in which the end result is indistinguishable to that produced by a human author, then it should receive copyright protection nonetheless. This is an elegant solution, one that incorporates the concept of the Turing test[105] into law, making the standard of legal authorship one that would make the assumption that the author is human regardless of the process that gave rise to it. While it is tempting advocate for such a test, this would unfortunately incorporate a qualitative test to copyright that it currently lacks. Judges would have to be asked whether a text, a song or a painting are the product of a human or a machine. Any observer of modern art will understand why this may not be such a good idea, and it is easy to imagine judges getting it wrong more often than not.

Therefore, it is perhaps fortunate that Butler's Turing test copyright idea did not survive past *Feist*. For the most part, U.S. copyright law took a direction in which databases and compilations were left unprotected,[106] while having a high standard of originality for other works.[107] Most computer-generated creations that were deemed mechanical were not thought worthy of protection, while works in which the human component was clearly original were copyrightable, and with few exceptions[108] there was little debate as to whether computer-generated copyright would be a problem. In fact, in a review of the status of the law regarding artificial intelligence works post-Feist, Miller commented that while "neural networks raise a number of interesting theoretical issues, they are not yet in a very advanced stage of

[99] National Commission On New Technological Uses of Copyrighted Works, *Final Report On New Technological Uses of Copyrighted Works* (I979).

[100] P. Samuelson, 'CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form' (1984) *Duke Law Journal* 663.

[101] T. L. Butler, 'Can a Computer be an Author? Copyright Aspects of Artificial Intelligence' (1982) 4 *Communications and Entertainment Law Journal* 707.

[102] Ibid, at 730.

[103] Ibid, at 733-734.

[104] Ibid, at 746.

[105] The Turing test is a concept developed by Alan Turing to assess a machine's ability to exhibit intelligent behaviour. If a machine is capable of behaving and communicating in a way that is indistinguishable to that of a human, then that machine will be considered to be intelligent. See: A. Turing, 'Computing Machinery and Intelligence' (1950), 59 *Mind* 433.

[106] J. F. Hayden, 'Copyright protection of computer databases after Feist' (1991) 5 *Harvard Journal of Law and Technology* 215.

[107] H. B. Abrams, 'Originality and Creativity in Copyright Law' (1992) 55 *Law and Contemporary Problems* 3.

[108] D. Glasser, 'Copyrights in Computer-Generated Works: Whom, if Anyone, do we Reward?' (2001) 1 *Duke Law and Technology Review* 24.

development."[109] Perhaps accurately at the time, Miller advocated not to rush to any changes in the law until real cases emerged, and it seems like this "wait and see" strategy was to prevail.

This all has changed in recent years with the advances in artificial intelligence depicted above. With machines set to make more and more creative decisions, the question about the copyright status of those works has resurfaced. If one believes that computer-generated works are worthy of protection, then the challenge is to get past the seemingly insurmountable obstacle that is *Feist*. Bridy rises to the challenge by recognising that there are not yet any cases dealing with "procedurally generated artworks",[110] so she uncovers a number of cases of non-human authorship. This is a very interesting avenue to explore, if we can find cases where copyright has been granted despite the lack of a human author, then this could boost the case for artificial intelligent ones. Some of these cases involve claims of authorship by non-human entities, be it aliens,[111] celestial beings,[112] or spiritual guides,[113] which have been dictated to human authors. The common element in all of these cases has been that the courts gave copyright ownership to the human author, as they found "a sufficient nexus to human creativity to sustain copyright".[114] Bridy astutely comments that these cases could be used to justify copyright in procedurally generated artworks, as the possible automated element can be ignored and originality, if any exists, would be given to the author. This would be entirely consistent with the way in which the UK deals with computer-generated works.

However, the U.S. Copyright Office has recently made a categorical statement that makes it difficult to interpret in favour of the existence of non-human authors. The U.S. has a voluntary system of registration, and while this formality is not a prerequisite for the subsistence of copyright, it is necessary in order to enforce rights.[115] In the latest guidelines for registration, the Copyright Office clearly declares that it "will register an original work of authorship, provided that the work was created by a human being."[116] They base this specially on the U.S. Supreme Court decision in *Trademark Cases*,[117] which defines copyright as protecting fruits of intellectual labour that "are founded in the creative powers of the mind."[118] Nonetheless, one could interpret that this declaration is worded in a manner that could still allow some computer-generated content if there is enough human input into it. Similarly, it must be pointed out that this is not law, this is just a compendium of practices at the offices, and that these could be changed or re-drafted in future editions.

Interestingly, other commentators appear to be moving towards a more European method of authorship that emphasises the author's creative intent. Boyden in particular comments that emergent works could be given copyright by requiring a claimant to prove human authorship by establishing that the output "foreseeably includes a meaning or message that the author wishes to convey".[119] This formulation sounds remarkably like the current standard of originality that reflects the personality of the author.

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[109] A. Miller, 'Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?' (1993) 106 *Harvard Law Review* 977, at 1037.

[110] A. Bridy, 'Coding Creativity: Copyright and the Artificially Intelligent Author' (2012) 5 *Stanford Technology Law Review* 1, at 18.

[111] Urantia Foundation v. Maaherra, 114 F.3d 955 (1997).

[112] Penguin Books U.S.A., Inc. v. New Christian Church of Full Endeavor, Ltd. 2000 U.S. Dist. LEXIS 10394.

[113] Garman v. Sterling Publ'g Co., 1992 U.S. Dist. LEXIS 21932.

[114] Bridy, n 110 above, at 20.

[115] 17 U.S. Code § 411.

[116] U.S. Copyright Office, *Compendium of U.S. Copyright Office Practices* (2014) 3rd Edition, at 306.

[117] Trademark Cases, 100 U.S. 82 (1879).

[118] Ibid, at 94.

[119] Boyden, n 50 above, at 393.

On the other hand, other commentators do not see a problem with the current situation, at least not yet. Grimmelman makes a compelling case that there is no such thing as an artificial intelligent author, as most of the current examples are a mirage, and that talk of authorship has been fuelled by the "novelty and strangeness" of some computer programs.[120]

Nonetheless, Grimmelman's more sceptical take on computer-generated works appears to be in the minority at the moment, although it is true that we still do not have case law reviewing ownership in the United States. However, it may be only time before a copyright infringement case is defended with the argument that the work has no copyright because it was produced by an artificial intelligent machine.

3.3.2 Australia

Australia presents an interesting contrast with regards to protection of computer-generated works because it lacks the wording of s 9(3) CDPA that has been adopted by other countries such as New Zealand and Ireland.[121] The requirement for authorship is strictly tied to the existence of a person,[122] which could leave out works made by computers, a fact that had already been identified by the Australian Copyright Law Review Committee in 1998 as potentially problematic.[123] As a result of this lack of protection, there is now case law in Australia where works that might have been protected in jurisdictions such as the UK have been declared as not covered by copyright because of lack of human authorship.[124]

Although at some point there were some concerns that the *Feist* standard from the US would be exported around the world,[125] it is difficult to find a country that has had a similar approach to originality, although countries such as Australia have been grappling with the question.

This is evident in the case law that has been dealing with databases.[126] A very indicative case showing the contrasting take on originality in Australia can be found in *Desktop Marketing Systems v Telstra Corporation*.[127] The facts are somewhat reminiscent of *Feist*, where Desktop Marketing Systems produced a CD version of the phone directories belonging to Telstra, who claimed that such action infringed their copyright. In first instance[128] the judge decided that the phone directories had copyright and therefore the respondent had infringed copyright. The case was appealed, and the Federal Court decided that the phone directories indeed have copyright even if they were a compilation of data. The Court directly addresses the Feist claim that a compilation of data cannot have copyright by declaring that the "task of carefully identifying and listing units"[129] can be useful, and therefore could carry copyright protection.

So, *Desktop Marketing Systems* diverged from the strict *Feist* standard, opening the door to the protection of compilations, and therefore allowing a less restrictive approach to originality. However, this case was reversed in *IceTV v Nine Network Australia*,[130] where a provider of a

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[120] J. Grimmelman, 'There's No Such Thing as a Computer-Authored Work— And It's a Good Thing, Too' (2016) 39 *Columbia Journal of Law and the Arts* 403, at 414.
[121] See n 52 above.
[122] For example, s 10 Copyright Act 1968 (Australia) defines the author of a photograph as "the person who took the photograph".
[123] Parliament of Australia, 'Simplification of the Copyright Act 1968 - Part 2: Categorisation of Subject Matter and Exclusive Rights, and Other Issues' (1999) 15 *Research Note* 1, at 2.
[124] McCutcheon, n 52 above.
[125] D. Gervais, 'Feist Goes Global: A Comparative Analysis of the Notion of Originality in Copyright Law' (2002) 49 *Journal of the Copyright Society of the U.S.A.* 949.
[126] The cases listed here have been highlighted by McCutcheon, n 52 above.
[127] Desktop Marketing Systems Pty Ltd v Telstra Corporation Limited [2002] FCAFC 112.
[128] Telstra Corporation Limited v Desktop Marketing Systems Pty Ltd [2001] FCA 612.
[129] Desktop Marketing, at 161.
[130] IceTV Pty Limited v Nine Network Australia Pty Limited [2009] HCA 14.

subscription-based electronic programme guide via the Internet would gather TV schedule data from the broadcaster Nine Network and offer it to its subscribers. While part of the judgement relied on whether the copying of the schedule had been substantial, the relevant issue to the present article was whether TV schedules have originality. In this, *IceTV* resembles Fesit more, as the High Court decided that there was not enough skill and labour in the expression of time and title required to create a program, on the contrary, it was minimal.[131] A similar result can be found in the more recent case of *Telstra Corporation v Phone Directories Company*,[132] where the judge goes as far as to declare that phone directories involved in the litigation were not original because the authors of these works had not exercised "independent intellectual effort".[133]

By choosing a narrower interpretation of originality, *IceTV* and *Telstra Corporation* show us that a higher threshold of originality can have negative effects with regards to the protection given to computer-generated works. This is evident in the case of *Acohs v Ucorp*,[134] where the claimant sued the respondent for copyright infringement of the source code of one of its programmes. Acohs and Ucorp are both in the business of developing software used to automatically fill industrial health and safety forms, which can be a time consuming endeavour, particularly in large enterprises. Both developers have different ways of producing and filling the forms, the Acohs system in particular does not store documents, it rather stores information in a database and then when requested by the user, the software pulls that data and creates the requisite form. In other words, the Acohs system procedurally creates a new document automatically upon request. Ucorp is accused of reproducing the resulting document by extracting HTML code from the documents, as well as layout, presentation and appearance of the outputs.[135]

In a baffling decision, the judge ruled that the resulting output did not have copyright protection because the source code had been generated by the system, and as such it had no "single human author".[136] By being generated by a computer program, its originality was compromised and it could not have copyright. Going back to the arguments of whether the author of a computer-generated work is the programmer or the user, Jessup J argued that those who initiated the program to generate code were not computer programmers, rather they were just using the software, and therefore they could not be authors.[137] The case was appealed, but the result was the same as the Federal Court decided that the code had not emanated from human authors, and therefore it "was not an original work in the copyright sense."[138]

This decision bodes ill for computer-generated works in general, and for artificial intelligence in particular. Reading the facts of the case, it is evident that the Acohs system is in no way a complex machine learning mechanism, it is a rather basic use of databases to produce documents and source code. It is remarkable that a court would not consider this function to be worthy of copyright protection, and it shows precisely what a decision based on narrow understanding of originality that is on display in cases such as *Feist*, *IceTV* and *Telstra Corporation* can produce negative results. If a system such as Acohs does not have a chance to be declared original, what chance do more complex artificial intelligence systems have?

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[131] Ibid, at 54.
[132] Telstra Corporation Limited v Phone Directories Company Pty Ltd [2010] FCA 44.
[133] Ibid, at 340.
[134] Acohs Pty Ltd v Ucorp Pty Ltd [2010] FCA 577.
[135] Ibid, at 86.
[136] Ibid at 50.
[137] Ibid at 52.
[138] Acohs Pty Ltd v Ucorp Pty Ltd [2012] FCAFC 16, at 57.

4. Making the case for harmonisation

For a system of protection that is supposed to be harmonised at an international level in order to promise predictability and ease of conducting business,[139] it is remarkable that the concept of originality, one of the most basic elements of authorship, is in such a state of disharmony. While the European standard of "the author's own intellectual creation" has now been seamlessly incorporated to the UK standard of skill and labour, the higher threshold in countries like the United States and Australia are still irreconcilable with the prevailing European approach. It is difficult to imagine an equivalent to *Temple Island Collections* bringing together such disparate standards as *Infopaq*, *IceTV*, and *Feist*.

It is clear that the various attitudes towards originality in computer-generated works highlighted above represent even more of a challenge. While originality may have been harmonised in Europe to a certain extent, it is impossible to foresee a case that would bring together Infopaq and s 9(3) CDPA. On the contrary, it would be possible to imagine a case that would try to declare the computer-generated work clause in UK as contrary to European law.

While the concern of those who believe that there is no need to make changes to the law should be taken into account, *Acohs* shows us a future in which artificial intelligence works are not given copyright protection due to strict interpretation of what constitutes an original work. The requirement of having a human make all of the important creative decisions could have significant economic effect in the future.

Besides computer code, there is one area where the effect of not giving protection to emergent works could have a serious commercial effect, and this is in the area of databases. It is no coincidence that some of the most important originality cases explored in the previous sections relate to data collection and compilation in one way or another.[140] At the heart of the problem with data collections is the fact that courts have to decide whether the often mechanical selection and gathering of data constitutes an original work worthy of copyright protection.[141] Why is this relevant to the subject of computer-generated works? Because machine learning algorithms are already widely deployed in some of the most popular websites in the world.

One of the most famous machine learning systems in the world is Amazon's famous recommendation system, known as Deep Scalable Sparse Tensor Network Engine (DSSTNE, pronounced 'destiny'). This system populates Amazon's pages with unique recommendations for visitors based on previous purchases, and now it has been made available to the public under an open source licence,[142] which could lead to a much wider adoption of machine learning techniques, and also increase the potential for a copyright suit arising from the authorship of machine-made webpages. Netflix is another company that relies considerably on intelligent recommendation systems to populate film listings tailored for each user.[143]

These systems have human input in the sense that they were programmed by humans, but each unique work, namely the page displaying recommendations and listings, is created procedurally. Based on the current state of the law, these pages only have copyright

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[139] K. D. Crews, 'Harmonization and the goals of copyright: Property rights or cultural progress?' 6 *Indiana Journal of Global Legal Studies* 117, at 117-118.

[140] And it is no coincidence either that this is also the case in some other notorious decisions not cited here. See: Case C-338/02, Fixtures Mktg. Ltd. v. Svenska Spel AB [2004] E.C.R. I-10497; and Case C-203/02, British Horseracing Bd. Ltd. v. William Hill Org. Ltd. [2004] E.C.R. I-10415; just to name a couple.

[141] B. C. Newell, 'Discounting the Sweat of the Brow: Converging International Standards for Electronic Database Protection' (2011) 15 *Intellectual Property Law Bulletin* 111.

[142] https://github.com/amznlabs/amazon-dsstne.

[143] A. Arokisamy, 'Meson: Workflow Orchestration for Netflix Recommendations' (May 31, 2016), *The Netflix Tech Blog*, http://techblog.netflix.com/2016/05/meson_31.html.

unequivocally in the UK. While companies such as Amazon and Netlfix may not be too bothered about possible infringement, the future users of DSSTNE and other similar machine learning systems that generate listings may be more concerned about copying from competitors.

So there is certainly scope for harmonisation. It is the contention of the present work that the best system available at the moment is the computer-generated work clause contained in s 9(3) CDPA. This has several advantages: it would bring certainty to an uncertain legal area; it has already been implemented internationally in various countries; it is ambiguous enough to deflect the user/programmer dichotomy question and make it analysed on a case-by-case basis; and it has been in existence for a relatively long time without much incident.

Moreover, a standard that allocates authorship to the person who made the necessary arrangements for a work to be made is consistent with existing law and case law. There is no need to change originality standards as such, we would only be creating an addendum that applies to works made by a computer.

5. Conclusion

At the end of the film Blade Runner, Roy Batty, an artificial entity (called replicant in the movie), makes an impassioned speech before his death:

> *"I've seen things you people wouldn't believe. Attack ships on fire off the shoulder of Orion. I watched C-beams glitter in the dark near the Tannhäuser Gate. All those moments will be lost in time, like tears in the rain. Time to die."*

While the film had characterised Batty as an inhuman killing machine intent on revenge, the final scene serves to display his humanity. An important element of the film's plot is that some replicants do not know that they are not human, implying that the distinction between self-aware machines that think they are human, and real humans, is inexistent.

We are not at that stage yet, but we are certainly approaching a situation in which it will be difficult to discern if a song, a piece of poetry, or a painting, are made by a human or a machine. The monumental advances in computing, and the sheer amount of computational power available is making the distinction moot.

So we will have to make a decision as to what type of protection, if any, we should give to emergent works that have been created by intelligent algorithms with little or no human intervention. While the law in some jurisdictions does not grant such works with copyright status, countries like New Zealand, Ireland, South Africa and the UK have decided to give copyright to the person who made possible the creation of procedural automated works.

This article proposes that it is precisely the model of protection based on the UK's own computer generated work clause contained in s 9(3) CDPA that should be adopted more widely. The alternative is not to give protection to works that may merit it. Although we have been moving away from originality standards that reward skill, labour and effort, perhaps we can establish an exception to that trend when it comes to the fruits of sophisticated artificial intelligence. The alternative seems contrary to the justifications of why we protect creative works in the first place.