ARTIFICIAL INTELLIGENCE PAINTING THE BIGGER PICTURE FOR COPYRIGHT OWNERSHIP

Courtney White* and Rita Matulionyte**

To receive copyright protection in Australia works must be original, amongst other requirements. The originality standard involves 'independent intellectual effort' that originates from an actual person. The reality of today's creativity domain is that works are not always originating from actual persons. Due to impressive advancements in technology, some works are being created by artificial intelligence and without the involvement of an actual person. These works cannot meet copyright requirements under current law and subsequently do not receive copyright protection. This paper endeavours to answer a two-tiered question posed by the challenges artificial intelligence works have on traditional concepts of copyright. Firstly, should copyright subsist in works created by AI? Secondly, who would possibly be the copyright owner for such works? Answering these questions involves a discussion of utilitarian and natural rights theories and references to US and UK discussions on the conversation around copyright and artificial intelligence.

I. INTRODUCTION

Worldwide exponential advancement in technology has heralded the beginning of a fourth industrial revolution.[1] A key transformative technology amidst these advancements is artificial intelligence ("AI"),[2] the ability of a computer system to 'perform tasks normally requiring human intelligence'.[3] Global leader in AI, Andrew Ng, has coined AI the 'new electricity' as

* LLB & Diploma of Legal Practice Student, University of Newcastle; courtneyw38@gmail.com
** Dr., LL.M. (Munich), Senior Lecturer, Macquarie Law School; rita.matulionyte@mq.edu.au; Twitter: rita_matu

1 Klaus Schwab, *The Fourth Industrial Revolution* (World Economic Forum, 2016) 7; Intellectual Property Strategy Headquarters, 'Intellectual Property Strategic Program 2016', *Kantei* (Program, May 2016) 3 <https://www.kantei.go.jp/jp/singi/titeki2/kettei/chizaikeikaku20160509_e.pdf>.

2 Intellectual Property Strategy Headquarters, 'Intellectual Property Strategic Program 2016', *Kantei* (Program, May 2016) 3 <https://www.kantei.go.jp/jp/singi/titeki2/kettei/chizaikeikaku20160509_e.pdf>.

3 English Oxford Living Dictionary (online at 25 May 2019) 'artificial intelligence'.

it transforms every industry.[4] AI has the 'potential to challenge a number of legal assumptions in the short, medium, and long term'.[5]

Creative industries have started experimenting with AI and have employed it to create works of different kind. The concept of works being created by AI is 'no longer just the stuff of science fiction movies.'[6] AI is currently 'painting pictures, writing poetry and making music'.[7] In 2016 an AI program wrote a short novel that almost won the Nikkei Hoshi Schnichi Literary Award in Japan.[8] Further to this, works by AI are being commercialised. By way of example, an artwork created by AI, the *Portrait of Edmond Belamy*, sold at the historic Christie's Auction House in New York for almost $620,500.00 (AUD) in October 2018,[9] and Warners Music signed the world's first-ever record label with an AI algorithm at the beginning of 2019 to produce 20 albums in 2019.[10] At Google I/O, an annual developer conference in California, Onformative showcased their audio-visual art installation, *Meandering River* that comprised real-time visuals generated by an algorithm and music composed by AI.[11]

[4] Andrew Ng quoted in E Kumar Sharma, 'AI is the New Electricity, Says Coursera's Andrew Ng,' *Business Today* (Article, 5 March 2018) <https://www.businesstoday.in/opinion/interviews/ai-is-the-new-electricity-says-courseras-andrew-ng/story/271963.html>.
[5] Peter Stone et al, 'Artificial Intelligence and Life in 2030: One Hundred Year Study on Artificial Intelligence', *AI100 Stanford* (Report, September 2016) 45 < https://ai100.stanford.edu/sites/g/files/sbiybj9861/f/ai_100_report_0831fnl.pdf>.
[6] 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] (4) *Michigan State Law Review* 659, 668 citing Brad Merrill, *It's Happening: Robots May Be the Creative Artists of the Future*, MAKE USE OF (Dec. 17, 2014), http://www.makeuseof.com/tag/happening- robots-may-creative-artists-future/ [https://perma.cc/8AY7-NPDA].
[7] Maria Diaz, 'Artificial Intelligence and Copyright', *Lexology* (Article, 17 April 2018) <https://www.lexology.com/library/detail.aspx?g=ab3340fa-57e5-4145-afe9-110b088c9e36>.
[8] Chloe Olewitz, 'A Japanese A.I. Program Just Wrote a Short Novel, and it Almost Won a Literary Prize', *Digital Trends* (Article, 23 March 2016) <https://www.digitaltrends.com/cool-tech/japanese-ai-writes-novel-passes-first-round-nationanl-literary-prize/>.
[9] Gabe Cohn, 'AI Art at Christie's Sells for $432,500', *The New York Times* (online, 25 October 2018) <https://www.nytimes.com/2018/10/25/arts/design/ai-art-sold-christies.html>.
[10] 'Warner Music Signs First Ever Record Deal with an Algorithm', *The Guardian* (online, 23 March 2019) < https://www.theguardian.com/music/2019/mar/22/algorithm-endel-signs-warner-music-first-ever-record-deal>.
[11] 'Work – Meandering River', *Onformative* (Web Page, 2018) <https://onformative.com/work/meandering-river>.

The emergence of works created by AI requires us to rethink basic legal concepts such as copyright protection requirements and ownership.[12] To receive copyright protection for a work in Australia it is essential that the work originates from one or more human authors.[13] This requirement suggests a commitment to the concept of romantic authorship. Works created by AI arguably cannot satisfy this requirement. As a result, these works do not receive copyright protection and immediately enter the public domain. The question emerges whether such current legal situation is justified or whether any changes in law are needed.

The article will first introduce readers to the concept of AI and its different types. Second, it will revisit copyright protection requirements and discuss cases that introduced 'human author' element as a precondition for a work to get copyright protection. Then, it will argue that it is worthwhile to provide copyright protection to works created by AI and, finally, assess who would be the owner of rights into such works. The analysis in this article is based on Australian copyright law, with references to the US and UK discussion on this question.

II. ARTIFICIAL INTELLIGENCE

AI has been referred to as a 'suitcase word' as it can mean many things.[14] Colloquially, it is 'a term used for when a machine imitates the cognitive functions commonly associated with human minds, such as problem solving and learning.'[15] AI is capable of imitating the cognition of creativity and this is shown by the production of works in 'almost every copyrightable medium, such as music, poetry, literature, news, and many others.'[16] This chapter will explore

[12] Yanisky-Ravid, n 6, 683.
[13] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142, 143.
[14] Marvin Minsky cited in Tina Nord, 'What is Artificial Intelligence', *Lernen Wie Maschinen* (Article, 12 April 2018) < https://www.lernen-wie-maschinen.ai/en/ki-pedia/was-ist-kuenstliche-intelligenz/>.
[15] Garrett Huson, 'I, Copyright' (2018) 35 *Santa Clara High Technology Law Journal* 54, 55 citing Stuart J. Russell & Peter Norvig, Artificial Intelligence: A Modern Approach 4-5 (1995).
[16] Yanisky-Ravid, n 6, 668 citing Peter Kugel, *Artificial Intelligence and Visual Art*, 14 LEONARDO 137, 137-39 (1981).

examples of AI in more detail to demonstrate how AI actually works and identify the various types of AI. A key distinction will be made between the opaque processes behind computer generated works and AI as their levels of autonomy vary.

Packed into the 'suitcase' of AI are various types of AI placed along a spectrum from weak to strong or narrow to general.[17] For the purpose of this paper, the more relevant AI is strong and general AI that is capable of 'autonomously creating works, with little to no human input.'[18] The technology has advanced to a point that we have reached the fourth wave of AI, autonomy.[19] AI is no longer acting as a tool to assist humans to create works; the technology is generating works autonomously.[20] By using neural networks, the capabilities of AI have expanded beyond 'simple mathematical tasks,' processing information in ways much like human brains.[21]

A breakthrough example of strong autonomous AI is *AlphaGo*. *AlphaGo* is an AI program designed by UK company, DeepMind, to play the intuitive board game called Go.[22] The significant characteristic of the board game is that the 'number of possible configurations of the board are more than the number of atoms in the universe.'[23] *AlphaGo* implemented a type of AI, reinforcement learning, to successfully account for this large number of possible configurations and teach itself to play the game. *AlphaGo* became so advanced that it beat 18-

[17] Russ Pearlman, 'Recognizing Artificial Intelligence (AI) As Authors and Inventors Under U.S. Intellectual Property Law' (2018) 24(2) *Richmond Journal of Law and Technology* 1, 11.
[18] Ana Ramalho, 'Will Robots Rule The (Artistic) World? A Proposed Model For The Legal Status Of Creations By Artificial Intelligence Systems' (July 2017) 21(1) *Journal of Internet Law* 12, 13.
[19] AI expert, Kai-Fu Lee, identifies four waves of artificial intelligence including internet, business, perception and autonomous: Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order* (Houghton Mifflin Harcourt, 2018) 105.
[20] Rex M Shoyama, 'Intelligent Agents: Authors, Makers, and Owners of Computer-Generated works in Canadian Copyright Law' (2005) 4(2) *Canadian Journal of Law and Technology* 129, 131.
[21] Pearlman, n 17, 6 [8].
[22] DeepMind Technologies Limited, 'AlphaGo', *Deepmind* (Web Page, 2019) < https://deepmind.com/research/alphago/>.
[23] *AlphaGo* (Netflix, 2017).

Time World Champion Go Player, Lee Sedol, four games to one.[24] Within the reinforcement learning is the use of neural networks. The neural networks 'mimic the function of human brains by absorbing and distributing their information processing capacity to groups of receptors that function like neurons; they find and create connections and similarities within the data they process.'[25] The use of neural networks allows AI to learn from the input data and teach itself, rather than being supervised by parameters from the already labelled input data. Therefore, reinforcement learning goes beyond machine learning as it can make decisions. Reinforcement learning is an aspect of technology that will warrant even further advancements in AI, and see AI enter 'the realm of learning about and executing actions in the real world.'[26]

Away from the gaming industry and into the creative industry, there is the example of Google Magenta that also uses neural networks. Neural networks are used in Google Magenta to simulate the human brain without the actual aid of human input to compose music.[27] According to Andrew NG, the basic idea behind how these AI systems produce new and creative works is akin to building a rocket ship.[28] To build a rocket ship, you need a huge engine and a lot of fuel. The rocket engine is the learning algorithms, and the fuel is the input data.[29] By fueling the learning algorithms with input data an output is produced and you have take-off.

While the basis of AI in its algorithms and code is mathematical, the subjective world of human creators inevitably influences their works. The mathematical basis of AI creates a misconception of objectivity and suggests AI cannot be creative because there is no subjective

[24] DeepMind Technologies Limited, n 22.
[25] Yanisky-Ravid, n 6, 675.
[26] Stone et al, n 5, 12.
[27] Pearlman, n 17, 8 citing Matt McFarland*, Google's Computers Are Creating Songs. Making Music May Never Be the Same*, WASH. POST (June 6, 2016), https://www.washingtonpost.com/news/innovations/wp/2016/06/06/googles-computers- are-creating-songs-making-music-may-never-be-the-same/?utm_term=.55226125405c, https://perma.cc/4389-VN6N (last visited Mar. 27, 2018).
[28] 'Understanding Artificial Intelligence, Machine Learning and Data', *Buckham & Duffy* (Blog Post, 17 November 2017) <http://www.buckhamduffy.com/blog/artificial-intelligence-machine-learning-and-data>.
[29] 'Understanding Artificial Intelligence, Machine Learning and Data', n 29.

world to gather inspiration from.[30] It is arguable that algorithms are essentially 'opinions embedded in code'[31] and therefore are subjective. This subjectivity supports the contention that AI can be creative because the input data acts as 'a verbal or visual vocabulary of its own'.[32] The input data is fundamental, as it is equivalent to the subjective world of a human author and allows AI to 'compose a range of distinct works from that vocabulary by independently applying a system of rules.'[33] It is apparent that computer algorithms and learning machines are now a 'new source of creativity.'[34]

The creativity of AI has been described to be determined by a 'dial of creativity.'[35] When this dial is turned up high, AI will be extra creative and produce works that do not always make sense. An example is Google's AI program, *Poem Portraits*, that generates a poem from one input word. When the word 'copyright' was entered, the AI system created the following perplexing poem: '*This copyright proceeds and seems, This gloom of the deep dews are still and grave*.'[36] On the other hand, when the dial is turned down low, AI will produce an output that is repetitive and possibly plagiarism of the input data.[37] It is when the dial is in the middle where balance is achieved to create a work that is indistinguishable from a human author.

[30] Diaz, n 7.
[31] TED, 'The era of blind faith in big data must end | Cathy O'Neil' (YouTube, 7 September 2017) <https://www.youtube.com/watch?v=_2u_eHHzRto>.
[32] Annemarie Bridy, 'Coding Creativity: Copyright and the Artificially Intelligent Author' (2012) *Stanford Technology Law Review* 5, 21.
[33] Bridy, n 32, 21 citing Roman Verostko, *Epigenetic Art Revisited: Software as Genotype, in* CODE: THE LANGUAGE OF OUR TIME 156, 159-60 (Gerfried Stocker & Christine Schopf eds., 2003).
[34] Kalin Hristov, 'Artificial Intelligence and the Copyright Dilemma' (2017) 57 *The Journal of the Franklin Pierce Center for Intellectual Property* 431, 431.
[35] 'Chocolate Chicken Chicken Cake,' *Sleepwalkers* (iHeartRadio, 9 May 2019) 00:10:44.
[36] Es Devlin, 'Poem Portraits', *Arts Experiments* (Web Page) <*https*://artsexperiments.withgoogle.com/poemportraits?_ga=2.33161846.992826029.1556786810-799000725.1554196893>.
[37] 'Chocolate Chicken Chicken Cake,' n 35.

As opposed to AI, computer generated works require a more significant level of human involvement when gathering input data and producing outputs. The Australian courts have largely considered cases concerning computer generated works, not works created by AI. It is the examples of computer generated works from the cases discussed in the next chapter that demonstrate the significant human input required for computer generated works. For instance, in *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* humans were involved in manually entering data to produce a telephone directory.[38] This is contrasted to Onformative's audio-visual art installation, *Meandering River*, that compiles satellite images itself and transforms them in real-time, 'changing iteratively and altering the simulated landscape around it.'[39] Unlike computer generated works, AI is not a tool. AI 'actually makes many of the decisions involved in the creative process without human intervention.'[40] There is a clear distinction 'between a computer program that requires a person to control and supply information to it, and intelligent agents that can autonomously gather information from numerous sources in a highly dynamic and decentralised environment'.[41]

AI 'is imprinted with design choices that can lead to both intended and unintended consequences',[42] whereas the output of computer generated works can be anticipated. In the example of *AlphaGo*, the AI performed moves in the board game by independently identifying patterns that the programmer did not expect. The term 'emergence' describes when programs produce outputs their programmers and users could not predict.[43] Computer generated works

[38] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142.
[39] Sedition, 'Onformative: Meandering River at Google I/O', *Sedition Art* (Magazine Article, 9 April 2019) <https://www.seditionart.com/magazine/onformative-meandering-river-at-google-i-o>.
[40] Andres Guadamuz, 'Artificial Intelligence and Copyright' (Issue 5, October 2017) *WIPO Magazine.*
[41] Shoyama, n 20.
[42] Australian Human Rights Commission and World Economic Forum, *Artificial Intelligence: Governance and Leadership* (White Paper, 2019) 8.
[43] Margot E Kaminski, 'Authorship, Disrupted: AI Authors in Copyright and First Amendment Law' (2017) 51 *University of California, Davis* 589, 593 citing Calo, Lessons of Cyberlaw, supra note 10, at 532, 538.

that have significant human involvement do not exhibit emergence. Therefore, AI performing beyond what it is programmed to do demonstrates its autonomy and its distinction from computer generated works.

III. STATUS QUO: NO COPYRIGHT PROTECTION

The first issue that needs to be clarified here is the legal status of works created by AI. In order to receive copyright protection under Australian copyright law, a work must be expressed in material form,[44] it must fall within the parameters of the categories of works,[45] it must be original,[46] and it must be connected in some way to Australia.[47] Works created by AI are able to meet essentially all of these requirements, except for the current originality standard.

A. Previous Originality Standard

Historically, the standard of originality under Australian copyright law was 'quite low.'[48] For a work to be protected under copyright law, a mere 'skill or labour' or 'sweat of the brow' was sufficient.[49] One of the first cases dealing with the originality standard in Australia was *Sands & McDougall Pty Ltd v Robinson*.[50] The case held 'the exercise of judgment and discrimination' was sufficient to confer originality.[51] There was no further explicit qualification that the work had to be by an actual person, as the law currently stipulates. According to Isaacs J, 'all literary works are protected if "original." That is the only condition.'[52] Therefore, AI, particularly the decision-making process of reinforcement learning, which includes 'the

[44] *Copyright Act 1968* (Cth) s 10(1) (definition of 'material form').
[45] *Copyright Act 1968* (Cth) s 10(1) (definition of 'work').
[46] *Copyright Act 1968* (Cth) s 32; *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142, 172 [100] (Perram J).
[47] *Copyright Act 1968* (Cth) ss 32(2)(c)-(e).
[48] Andrew Stewart et al, *Intellectual Property in Australia* (LexisNexis Butterworths, 6th ed, 2018) 172 citing CLRC 1995, [14.63].
[49] See, eg, *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458, [49].
[50] (1917) 23 CLR 49.
[51] Jani McCutcheon, 'The Vanishing Author in Computer-Generated Works: A Critical Analysis of Recent Australian Case Law' (2013) 36 *Melbourne University Law Review* 917, 942 citing (1917) 23 CLR 49, 52 (Isaacs J), cited in *IceTV* (2009) 239 CLR 458, 474 [33] (French CJ, Crennan and Kiefel JJ).
[52] *Sands & McDougall Pty Ltd v Robinson* (1917) 23 CLR 49, 57 (Isaacs J).

exercise of judgement and discrimination', potentially could have satisfied the prior originality standard that existed before the great advancements in AI.

The previous lower threshold is significant because it allowed a greater protection of 'investment of time, money and effort (…).'[53] For example, in *Desktop Marketing System Pty Ltd v Telstra Corp Ltd* case,[54] telephone directories were protected as 'original' works since they required 'substantial labour and expense'.[55] The substantial labour and expense were incurred by compiling and presenting the details of telephone subscribers in a particular region.[56] A team of human workers had 'laboriously rekeyed' the data manually.[57] If this lower originality standard applied today, it is arguable that works created by AI could meet this low originality standard. The 'industrious collection' referred to as sufficient for originality in *Desktop Marketing System Pty Ltd v Telstra Corp Ltd*,[58] is analogous to the output of AI.[59] AI 'collects' from the input data to create output and in some instances gathers the input data itself. Therefore, the output of AI as the particular collection of input data may have held copyright under this prior originality standard.

B. Current Originality Standard

Two relatively recent cases have changed the traditional standard of originality in Australia. First, the *IceTV Pty Ltd v Nine Network Australia Pty Ltd* case of 2009[60] that concerned Weekly Schedules of television broadcast information. IceTV gathered the programme time and title

[53] Stewart et al, n 48, 173.
[54] (2002) 119 FCR 491.
[55] (2002) 119 FCR 491, 599 [431].
[56] *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458, 503 [133] (Gummow, Hayne and Heydon JJ) discussing *Desktop Marketing System Pty Ltd v Telstra Corp Ltd* (2002) 119 FCR 491.
[57] Stewart et al, n 48, 174.
[58] (2002) 119 FCR 491.
[59] *Desktop Marketing System Pty Ltd v Telstra Corporation Limited* (2002) 119 FCR 491.
[60] *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458, 474 [33] (French CJ, Crennan and Kiefel JJ).

information from Nine's Weekly Schedule to create a subscription-based electronic programme guide called 'IceGuide.'[61] Nine alleged that IceTV's reproduction of the time and title information constituted a substantial part of their Weekly Schedule and therefore infringed copyright. However, the High Court found in favour of IceTV and held there was no infringement because there was no originality in the way the time and title of the television programmes could be expressed.[62] There was 'little, if any, choice' in the particular form of expressing the time and title of the television programmes.[63] Most importantly, in obiter, the High Court disapproved of prior originality standard of mere 'skill and labour' and affirmed 'that there must be some "creative spark" or exercise of "skill and judgment" before a work is sufficiently "original" for the subsistence of copyright.'[64]

This higher standard of originality set in IceTV case could still be met by works created by AI. It is arguable the AI process of discriminating through the input data to create an output satisfies the exercise of judgment required for a work to be considered sufficiently original. The problem of originality with relation to AI works arises with the successive cases of *Telstra Corporation Ltd v Phone Directories Company Pty Ltd*[65] and *Acohs Pty Ltd v Ucorp Pty Ltd*[66] which emphasise that copyright protection can only subsist if a work originates from *an actual person*.[67]

In *Telstra Corporation Ltd v Phone Directories Company Pty Ltd*,[68] humans were involved in gathering and organising the collection of material for the telephone directories, however this

[61] *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458.
[62] *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458, 477 [42].
[63] *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458, 477 [42].
[64] *IceTV Pty Ltd v Nine Network Australia Pty Ltd* (2009) 239 CLR 458, 516 [187] (Gummow, Hayne and Heydon JJ).
[65] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142.
[66] *Acohs Pty Ltd v Ucorp Pty Ltd* (2012) 201 FCR 173.
[67] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142, 172 [100] (Perram J).
[68] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142.

collection phase was not directed at the creation of the work. It was the extraction phase of arranging the directories in alphabetical order and subliming the information into electronic form that constituted the creation of the work.[69] As there was no human involvement in this extraction phase, copyright was held not to subsist in the telephone directories.[70] Namely, in *Telstra Corporation v Phone Directories Company*, the Full Federal Court not only followed the 'independent intellectual effort' standard introduced by the High Court in IceTV case, but also highlighted the requirement 'that the work originates with an author or joint authors'.[71] The absence of a human author behind the collection of directories by Telstra led to the absence of copyright protection in the directories.

The new originality standard makes it difficult, if not impossible, to award copyright protection to works created by AI. Similar to *Telstra Corporation v Phone Directories* case, in cases of works created by AI, humans do not directly participate in the creation of works. They create the algorithm and may (or may not) provide some input data, while the output, i.e. the work, is generated by AI independently. The difference from *Telstra Corporation v Phone Directories* case is that the equivalent of an extraction phase for AI is more sophisticated than a computer program generating a telephone directory. Rather than merely organising details in alphabetical order, AI exercises judgment to discriminate input data that has multiple possibilities beyond the order of the alphabet. Thus, the output of AI is much more creative than that of computer program as, for example, the one used by Telstra. Despite this, the output will not be protected if it is not generated by a human author.

[69] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142, 173 [102].
[70] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142, 193.
[71] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142, [82].

This conclusion has been confirmed in subsequent cases involving computer algorithms. In *Acohs Pty Ltd v Ucorp Pty Ltd*,[72] the creation of electronic material safety data sheets for hazardous products involved programmers and transcribers. The programmers wrote the program, Infosafe System, and the transcribers input data to affect the layout, appearances and attributes of the data sheet.[73] Similarly to *Telstra Corporation Ltd v Phone Directories Company Pty Ltd*,[74] the identifiable human involvement was not considered authorship because it did not relate directly to the creation of the work. It was the source code by computer program Infosafe System, not a human, that generated the material safety data sheets. Therefore, the human involvement in this case was further removed from the direct creation of the work. Human involvement can be even further removed in cases where AI can write its own code to generate a work.[75]

As a result, the requirement that works originate from an actual person presents a significant hurdle for works created by AI receiving copyright protection. Because origination from an actual person is an essential requirement to satisfy the originality standard and attract copyright, it is clear that works created by AI are not currently protected by copyright in Australia as they do not emanate from a human author.

IV. SHOULD COPYRIGHT SUBSIST IN WORKS CREATED BY AI?

The question that will be explored next is whether copyright *should* subsist in works created by AI. Answering this question involves a discussion of the theories of copyright.

[72] *Acohs Pty Ltd v Ucorp Pty Ltd* (2012) 201 FCR 173.
[73] 'Copyright in Source Code and Digital Products', *Lavan* (Web Page, 3 August 2010) < https://www.lavan.com.au/advice/intellectual_property_technology/copyright_in_source_code_and_digital_products>.
[74] *Telstra Corporation Ltd v Phone Directories Company Pty Ltd* (2010) 194 FCR 142.
[75] See, eg, AI application called Bayou discussed in Jade Boyd-Rice, 'New A.I. Application Can Write its Own Code', *Futurity* (Article, 25 April 2018) <https://www.futurity.org/artificial-intelligence-bayou-coding-1740702/>.

A. Utilitarian Theory

Utilitarian theory is said to constitute the backbone of intellectual property protection.[76] This theory conceptualises copyright as a utilitarian device to 'promote the creation of artistic or useful works that will benefit society.'[77] Promoting the creation of artistic or useful works involves providing an incentive to innovate which is inherent to the utilitarian theory. The utilitarian theory suggests without this incentive to innovate, authors might not invest the 'time, energy, and money necessary to create these works because they might be copied cheaply and easily by free riders, eliminating authors' ability to profit from their works.'[78]

The fundamental issue with an application of utilitarian theory to works created by AI is that 'AI systems do not need incentives to create artworks.'[79] AI systems are not susceptible to things like short term memory loss, information overload, sleep deprivation or distractions that humans are susceptible to and require an incentive to overcome.[80] Therefore, the incentive-based argument of utilitarian theory is redundant when considering AI system as a subject of copyright protection.

On the other hand, human beings are still indispensable for works to be created, even where an AI system is involved. First of all, AI systems are created by a human being, a team of them

[76] Amir H Khoury, 'Intellectual Property Rights for "Hubots": On the Legal Implications of Human-Like Robots as Innovators and Creators' (2017) 35(3) *Cardozo Arts and Entertainment Law Journal* 635, 652.
[77] Roberto Garza Barbosa, 'The Philosophical Approaches to Intellectual Property and Legal Transplants. The Mexican Supreme Court and NAFTA Article 1705' (Summer 2009) 31(3) *Houston Journal of International Law* 515, 517.
[78] Jeanne C Fromer, 'An Information Theory of Copyright Law' (2014) 64 *Emory Law Journal* 71, 74-75 citing Alina Ng, *The Author's Rights in Literary and Artistic Works*, 9 J. MARSHALL REV. INTELL. PROP. L. 453, 453 (2009); Symposium, *The Constitutionality of Copyright Term Extension: How Long Is Too Long?*, 18 CARDOZO ARTS & ENT. L.J. 651, 676 (2000) (statement of Wendy Gordon).
[79] Yanisky-Ravid, n 6, 700 citing Shlomit Yanisky-Ravid & Luis Antonio Velez-Hernandez, *Copyrightability of Artworks Produced by Creative Robots, Driven by Artificial Intelligence Systems and the Originality Requirement: The Formality-Objective Model*, 19 MINN. J.L. SCI. & TECH. 1.
[80] Yanisky-Ravid, n 6, 700 citing Shlomit Yanisky-Ravid & Luis Antonio Velez-Hernandez, *Copyrightability of Artworks Produced by Creative Robots, Driven by Artificial Intelligence Systems and the Originality Requirement: The Formality-Objective Model*, 19 MINN. J.L. SCI. & TECH. 1.

usually. Secondly, human action is needed to trigger an existing AI system to create works. A user (a human being) will either provide with some input data or, at least, activate the AI system, which is necessary for AI system to be able to start generating works.

On a similar vein, in *Telstra Corporation Ltd v Phone Directories Company Pty Ltd*[81] case, in the unsuccessful application for special leave to the High Court,[82] the applicant argued that 'human authorial contributions in the entire continuum of production should be considered, not just the human involvement at the final point of materialisation.'[83] This line of reasoning can be applied to AI works. While a human's intervention cannot be pinpointed in the final point of materialisation of a work created by AI, human intervention is easily identifiable earlier in the production continuum. For example, humans are behind the code that trains AI to make decisions and they also use the AI system. While there is no one holding the 'proverbial pen' to do the actual writing,[84] there are humans that can be identified as contributing to the works of AI in earlier stages of the production continuum and could be held 'responsible for the arrangements further up the chain.'[85]

One could therefore argue that human beings who in a certain way contribute to the creation of works generated by AI need to be provided an incentive to encourage such contribution. If human beings are in no way rewarded for such an activity, if they do not receive any benefits for creating AI systems or triggering them to create the works, they would not provide their indispensable contributions and the world community will end up with less (if any) creations generated by AI.

81 (2010) 194 FCR 142.
82 High Court, *Results of Special Leave Applications Heart at Melbourne* (2 September 2011) High Court <http://www.hcourt.gov.au/assets/registry/special-leave-results/2011/2_09_2011MelbResults.pdf>.
83 McCutcheon, n 51, 927.
84 Bridy, n 32, 21.
85 Ramalho, n 18, 18.

At the same time, it is questionable whether copyright protection for works generated by AI is in all cases indispensable in order to stimulate the production of works. Firstly, as far as human involvement in the development of AI is concerned, developers of software behind AI are already incentivized by copyright law. The software that underlies AI systems is protected as a literary work under copyright laws of Australia and other countries;[86] protection lasts for 70 years after the death of the (last surviving) author.[87] It is questionable whether an additional level of protection awarded for software developers would lead to additional incentive and increased outputs.[88] Therefore, under the utilitarian theory, vesting protection for AI-generated works into software developers might be unjustified as there is no proof that a second layer of copyright protection would lead to the development of more AI systems and, as a result, more works. However, as will be seen in a subsequent section, additional copyright protection to works created by AI might be justified under the natural rights theory. [89]

Another question is whether humans who provide a trigger for AI systems to create works, i.e. users of AI systems, always need to be incentivized to carry out such activities. The answer will probably depend on the extent and kind of effort exerted. If the user merely switches on the AI system or makes effort that is insubstantial or is not of an intellectual nature, it might be insufficient to attract copyright protection. Although even minor activities, such as activation of an AI system, are indispensable for AI system to start generating works, it would be disproportionate and excessive to award users with exclusive rights over the works generated. In contrast, if users vest a sufficiently significant intellectual effort that contributes to the creation of the work, such contribution might be worthwhile encouragement and, therefore, copyright protection could serve as a tool to incentivise such efforts by users.

[86] For Australia see *Copyright Act 1968* (Cth) s 47AB.
[87] *Copyright Act 1968* (Cth) s 129A(2)(a); *Computer Edge Pty Ltd v Apple Computer Inc* (1986) 161 CLR 171.
[88] Hristov, n 34.
[89] See below Part IV, B. Natural Rights Theory.

This argument is based on the utilitarian approach to copyright: Exclusive rights to works should be granted only in cases where absence of any exclusive control would lead to lack of incentive to make an effort and produce works, which would lead to less creative products reaching society.[90] Also, exclusive rights have to be granted only to the extent necessary to incentivise creativity, but not so excessive as to prevent reasonable access to works by public.[91] As a result, utilitarian theory could justify the protection of works created by AI only if human contribution that triggered the creation of such works is sufficiently significant. Namely, there is no point of incentivising insignificant contributions by users since they require very little effort and thus are likely to happen in any case. Under the utilitarian theory it is worth rewarding only those efforts that humans are not likely to exert without sufficient reward.

B. Natural Rights Theory

Natural rights theory provides another rationale for justifying copyright in works created by AI.[92] Simply stated, the natural rights theory refers to the notion of basic rights that cannot be denied. Philosopher, John Locke, recognises property as a fundamental natural right, because 'people are entitled to own both what they produce by means of their own efforts and whatever they have laboured on.'[93] The contextual development of this theory is important to consider, as it evolved at a time when intellectual property laws were not implemented and therefore only refers to tangible property if strictly applied. Despite the intangibility of intellectual property, successive scholars have consistently applied natural rights theory to intellectual property. Subsequently, intellectual property rights, such as copyright, have been considered

[90] Miranda Forsyth, 'The Digital Agenda Anti-circumvention Provisions: A Threat to Fair Use in Cyberspace' (2001) 12 *Australian Intellectual Property Journal* 82, 84.
[91] Forsyth, n 90.
[92] Owen Morgan, 'Graffiti – Ownership and Other Rights' (2007) 12 *Media and Arts Law Review* 167, 179.
[93] Janice Gray et al, *Property Law in New South Wales* (LexisNexis Butterworths, 4th ed, 2018) 14.

by some as equal to property rights in all types of assets.[94] As Gummow, Hayne and Heydon JJ pointed out in *IceTV Pty Ltd v Nine Network Australia Pty Ltd*, copyright is personal property.[95] Therefore, an author is entitled to copyright protection as a natural right because it protects the 'fruits of his labour.'[96]

Would natural rights theory justify granting copyright over works created by AI? As in the case of incentive theory the situation is more complex than it may seem from the first glance. To start with, it is quite clear that natural rights theory could not justify the granting of copyright to the AI system since only human beings have natural rights, not machines. Therefore, we should consider whether human beings who contribute to works created by AI could claim property rights over those works, as 'fruits of their labour'.

A metaphor may help to explain the complexity of the situation. When a tree has grown lemons, the farmer receives property rights in the lemon as a result of his labour, despite not actually growing the lemon. It is the tree that was directly performing the process of producing a lemon, yet no one would deny the farmer the 'fruits of his labour'.[97] Similarly, one could argue that, it is the AI, and not the human, that directly performs the process of creating the work into material form (the 'lemon'). However, the human should have a natural right to the work created by AI because the human created AI system in the first place and/or triggered it to generate works (compare to planting and watering the lemon tree).

[94] Adam Mossoff, 'Why Intellectual Property Rights? A Lockean Justification', *Law & Liberty* (Web Page, 4 May 2015) <https://www.lawliberty.org/liberty-forum/why-intellectual-property-rights-a-lockean-justification/>.
[95] (2009) 239 CLR 458, 483 [65] citing s 196(1).
[96] Joseph Savirimuthu, 'John Locke, Natural Rights and Intellectual Property: The Legacy of an Idea' (2013) 8(11) *Journal of Intellectual Property Law & Practice* 892, 892.
[97] Savirimuthu, n 96.

However, is the labour exerted by human beings involved always sufficient and not too remote from the final output for them to claim ownership of works created by AI? In some cases, humans designing the AI may envisage what *sort* of output the AI system will produce. For instance, in the case of the *Meandering River* mentioned above, individuals who programmed an AI system to collect satellite images and put them together into a real time installation could have had a general vision of a sort of work that AI would generate as an output. In such a case, when coders had a general vision of an output, it might be reasonable to attribute copyright in the artwork created by AI to the individuals who designed the AI system in the first place.

On a similar vein, courts in some jurisdictions have recognised that graphical user interface (GUI) is protected separately from the underlying software.[98] The underlying reason is likely to be the fact that software developers when writing a code can have a sufficiently clear vision of how the GUI will look like. Therefore, it is reasonable to provide them exclusive rights over the GUI and prevent others creating identical or very similar GUI by simply writing another source code. Similarly, in the case of computer games, software developers not only own rights into an underlying software but also into the result that software provides, ie an audiovisual expression of the game; it might be protected as an audiovisual work or other type of work (musical, graphical, etc).[99] In these cases software developers acquire rights to both GUIs and audiovisual expression of video games since they have envisaged them as a final output that software will produce; they thus count as 'fruits of their labour'. Similar rationale would apply to works created by AI as long as AI developers have certain vision of works that AI is going to produce.

[98] See eg EU case law: *Bezpecnostni Softwarova Asociace - Svaz Softwarove Ochrany v Ministerstvo Kultury (C-393/09)* [2011] E.C.D.R. 3 (22 December 2010).
[99] Andy Ramos et al, *The Legal Status of Video Games: Comparative Analysis in National Approaches* (WIPO Report, 2013) [14].

In other scenarios the AI system may be designed to accept a variety of different input data so that developers of the system are not able to even imagine what sort of outputs this may lead to. Drawing upon the example of the *Portrait of Edmond Belamy*, the code was downloaded online by a French artist who applied a new data set of more than 15,000 portraits between the 14th and 20th century to the 'borrowed' code and fashioned the idea of the painting. It is likely the person who created the code that was downloaded online would not have envisioned the input of such data, neither the output that it would produce.[100]

In such case, when output is very remote from the work of AI developers and they do not have a vision of a kind of works that AI is going to produce, it becomes unreasonable to give them exclusive control over such works. In comparison, developers of *MS Word* software cannot claim ownership of all texts written when using this software, even if they exercised significant creativity and intellectual effort when writing the software. Similarly, in the case of the *Portrait of Edmund Belamy*, although AI developers certainly exerted significant intellectual labour in creating the AI system, it is unlikely that developers had envisaged such kind of output. Thus, it could be argued that the output is a too remote from the work carried out by developers and that they should not be able to claim copyright over it.

As far as the AI user is concerned, the question is whether the 'labour' that they contribute is sufficient to give them ownership over the 'fruits'. In some cases users may have creative intellectual contribution in what sort of input data will be fed into the system to create a work. If the contribution is sufficiently significant and not merely mechanical, it might be sufficient to justify ownership of a final outcome. Following the same example of *Portrait of Edmund*

[100] 'Is Artificial Intelligence Set to Become Art's Next Medium?', *Christie's* (Web Page, 12 December 2018) < https://www.christies.com/features/A-collaboration-between-two-artists-one-human-one-a-machine-9332-1.aspx>.

Belamy, it was the idea of a user, a French artist, to feed the AI algorithm with a particular data set. Such creative idea and effort to implement it is likely to be sufficient to lead to copyright protection over the output that AI system subsequently generated.

In contrast, if the user contributes little or insignificant intellectual effort to the generation of the work, it is questionable whether such contribution would be sufficient to afford user with ownership over the final result generated by AI. For instance, feeding one single word into a AI system which then generates a poem is likely to be insufficient to vest copyright protection in a user who contributed that single word.[101] Also, coming back to the lemon example, if a neighbour waters the lemon plant several times, this effort is not sufficient to claim ownership over lemon fruits; the owner of the lemon tree will still own lemons that the tree grows. This is in line with arguments developed under the utilitarian theory suggesting that it is worthwhile incentivising users by granting copyright protection only if their contributions is sufficiently significant.

As a result, under the natural rights theory, the answer whether copyright protection should be vested into works created by AI depends on the kind and significance of labour exerted by human beings. Only if the labour is not too remote from the final output and demonstrates sufficient intellectual effort it might be reasonable under natural rights theory to afford those human beings with property rights over the final product produced by AI.

Notably, it appears from the above that in cases of some works created by AI, granting exclusive rights over works might be justified, e.g. when the individual's contribution is significant, and when the contribution is not too remote from the final output. In other cases,

[101] See Devlin, n 36.

however, when these criteria are not met, works might not deserve copyright protection at all. For instance, if the works created have not been envisaged by the developers and have not required any significant input by the user (i.e. it was created essentially independently by an AI system), there seems to be no reason to grant exclusive rights to any of the humans involved in the process. If their contribution was insignificant, it is not worthy of incentive by providing protection. Also, if the output of the AI system is too remote from the input made by human individuals, natural rights theory would not require granting property rights over that output. Such type of works would then fall into public domain and can be freely used by everyone.[102]

V. WHO SHOULD OWN WORKS CREATED BY AI?

If we agree that at least certain works created by AI could be granted copyright protection, the next question is who should own copyright in such works? A number of possibilities have been explored by commentators.[103] In this section four options will be explored: no one, AI itself, the coder/developer of the AI system and the user. After showing that no single option is sufficiently adequate, a middle ground solution will be discussed, based on the ownership allocation for computer generated works in UK copyright law.

A. No one and AI

Let us first discuss and discount the least suitable options, 'no one' and 'AI', as potential solutions for ownership allocation in works created by AI.

Firstly, in the section above we reached a conclusion that, at least in certain cases, it could be justified to grant copyright protection over works created by AI. If protection is granted, there

[102] Some authors suggest that all AI-generated works could fall into public domain, see, eg, Hristov, n 34, 437.
[103] See, eg, Pamela Samuelson, 'Allocating Ownership Rights in Computer-Generated Works' (Summer 1986) 47 *University of Pittsburgh Law Review* 1185, 1185; in Copyright Law Review Committee, *Computer Software Protection* (Office of Legal Information and Publishing, 1995) 247 [13.19] the following options were considered '(a) the programmer or owner of the copyright in the programs that assisted in creation of the work; (b) the provider of the data; (c) the user of the computer/computer program; or (d) the investor or owner of the computer/computer program'.

should be *someone* who owns exclusive rights. Thus 'no one' option can be generally rejected. However, in those cases where works created by AI are not granted copyright protection, i.e when the contributions from humans involved are not sufficient or too remote, then *no one* will have rights into the work and it will fall in public domain.[104]

The second option is to award ownership to AI itself. Although some commentators argue in favour of this option,[105] the suggestion seems to be premature. There are challenges to allocating ownership in AI itself due to its lack of legal status. Copyright ownership is 'only a piece in the constellation of legal standing' of AI.[106] If AI were granted legal status to receive copyright ownership, it would open the floodgates and bring about 'serious reflections on the broader consequences of affording legal personhood to machines.'[107] There are certain signs that legal personality of AI might need to be considered more seriously in the near future. For instance, Saudi Arabia became the first and, for now, the only country to grant legal status to AI when they granted citizenship to a robot, called Sophia.[108] Further to this, the World Economic Forum in a report published in September 2015 predicted 21 expected Technology Tipping Points. One of the 21 Technology Tipping Points is that by 2025 there will be an AI machine on a corporate board of directors.[109] For now, however, it seems to be premature and thus not plausible to allocate the copyright ownership to AI itself.

[104] Hristov, n 34, 437.
[105] Pearlman, n 17, 30.
[106] Ramalho, n 18, 18 citing Grimmelmann J, 'There's no such thing as a computer-authored work-- and it's a good thing, too,' 39 *Columbia Journal of Law & Arts* 2015-2016; 403:414.
[107] Ramalho, n 18, 18.
[108] Tracy Alloway, 'Saudi Arabia Gives Citizenship to a Robot', *Bloomberg* (Article, 27 October 2017) <https://www.bloomberg.com/news/articles/2017-10-26/saudi-arabia-gives-citizenship-to-a-robot-claims-global-first>.
[109] Klaus Schwab, *The Fourth Industrial Revolution* (World Economic Forum, 2016) 26 discussing *Deep Shift – Technology Tipping Points and Societal Impact*, Global Agenda Council on the Future of Software and Society, World Economic Forum, September 2015.

B. The Developer of AI or the User?

The two remaining options for attribution of ownership in AI-generated works are the developer of AI (the coder) and the end user. In the previous section they were identified as humans who contributed to the generation of works by AI and thus could potentially be awarded ownership to these works. Which one of them is a more appropriate person to whom ownership of AI-generated works could be attributed?

To start with, the developers of AI, or coders, are the ones who put the most significant intellectual effort into developing the AI system which then in turn generates works. As discussed above, under the natural rights theory, developers might be entitled to works generated by AI as to the 'fruits of their labour'. If AI developers have coded AI with a vision to produce certain kind of works, similar as in case of GUIs and video games, they should be entitled to acquire rights into works generated by AI.[110]

At the same time, vesting copyright into software developers would not be justified when coders' contribution is too remote from the final output. As an analogy, a person who creates a camera is not the person who gets copyright for a photo the camera takes. Rather, it is the person using the camera, who adjusts the settings, frames the photo and presses the button, that gets copyright in the photo. If the end output was not planned or envisaged by the coder and is too remote from his contribution, it would not be very reasonable to vest copyright to the work created by AI in the coder/developer of the AI system.

It is worth noting the practical issues that would arise if allocating copyright to the developer of AI. It will often be a team of coders (and other contributors) who develop, in a concerted

[110] See below Part IV, B. Natural Rights Theory.

effort, an AI system. It might be difficult to ascertain whose contribution is sufficient to qualify as co-author. It is a commonality that source code is available on license terms to encourage collaboration and development in software.[111] One person could have contributed a substantial amount to the code but another person could have just made a tweak to the code to make it a working code that could complete the function of creating works. Therefore, it would be difficult to determine who qualifies as the copyright holder.

Also, the legal relationship among coders is not very clear. If their contributions are inseparable, they might qualify as co-authors and joint owners under Australian copyright law. A work of joint ownership is defined as 'a work that has been produced by the collaboration of two or more authors and in which the contribution of each author is not separate from the contribution of the other author or the contributions of the other authors.'[112] There are multiple people involved in an AI team, from the software engineer to the data scientist. Some commentators argue that the kind of agreement and harmony of interest required for joint authorship is lacking in a typical AI situation.[113] Each team member makes a different and separate contribution, as demonstrated in the case of *Acohs Pty Ltd v Ucorp Pty Ltd*,[114] where it was held there was no joint authorship between the programmers and transcribers because their contributions were separate.

Even in cases where joint-ownership is established in a particular scenario, exercise of rights in this situation is difficult since permission of all co-owners is needed to license or assign rights into a software.[115] These legal issues get solved if the AI system is created in an

[111] Simon Stokes, *Digital Copyright: Law and Practice* (Hart Publishing, 4th ed, 2014) 133.
[112] *Copyright Act 1968* (Cth) s 10(1) (definition of 'work of joint ownership).
[113] Pamela Samuelson, 'Allocating Ownership Rights in Computer-Generated Works' (Summer 1986) 47 *University of Pittsburgh Law Review* 1185, 1222.
[114] *Acohs Pty Ltd v Ucorp Pty Ltd* (2012) 201 FCR 173.
[115] See, eg, *Seven Network (Operations) Ltd v TCN Channel Nine Pty Ltd* [2005] FCAFC 144, [20].

employment relationship, in which case the owner of software behind AI system will normally be the employer.[116] However, if the coders were working outside employment relationship (e.g. as contractors) contract would have to be carefully drafted in order to properly allocate the rights into AI system and into outputs of it, when applicable.

Looking at another option for ownership allocation – the user of an AI system – we come up with a similar conclusion. Vesting rights to AI-generated works into user is reasonable in some instances but lacks reasonableness in other instances. Namely, in situations where the user significantly contributed to the generation of the work (e.g. in case of Portrait of Edmond Belamy) both utilitarian and natural rights theories would allow attributing ownership to the user. However, in cases where the contribution is not significant, it might not be sufficient to qualify for copyright protection.[117] For instance, in case of Google's AI Program *Poem Portraits*, it is sufficient for a user to type one word in to the AI system to get the poem generated.[118] Although the user was the one who most directly contributed to the output of the AI system, their contribution arguably does not contain sufficiently significant effort to qualify for copyright protection.

The above analysis demonstrates that no *single* option discussed is adequate since the ownership of copyright into a work created by AI might vest in different persons depending of the kind of contribution to the end output. Thus, a broader test is needed to encompass a variety of scenarios that AI technology may bring. One of such broader tests is offered in the current UK copyright law.

[116] *Copyright Act 1968* (Cth) s 35(6).
[117] See above Part IV.
[118] Devlin, n 36.

C. The UK 'necessary arrangements' test

The UK was the first jurisdiction to introduce a provision for copyright protection in computer generated works.[119] The *Copyright, Designs and Patents Act 1988* (UK) s 9(3) allows copyright to be awarded to the work generated by a computer. It provides that the author of a computer generated work is taken to be 'the person by whom the arrangements necessary for the creation of the work are undertaken'. While s 9(3) was initially suggested to provide adequate protection to investors of satellite photography,[120] other reasons for its introduction included "an acknowledgement of the reality that computer technology was being used to create materials of the kind protected by copyright and that the law should provide flexibility for future technological developments, the objective of future-proofing copyright law in the face of rapid changes in technology, and the need to make the law easier to understand apply" (footnotes omitted).[121] A number of countries such as New Zealand, India, Hong Kong and Ireland have adopted identical or similar 'necessary arrangement' test for identifying who the author is of computer generated works.[122] In Australia, the Copyright Law Review Committee Report on Computer Software Protection[123] recommended the introduction of a similar provision into Australian *Copyright Act 1968* (Cth)[124] but the recommendation was not enacted in law. Would

[119] 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* (Edward Elgar Publishing Ltd, forthcoming).
[120] Madeleine de Cock Buning, 'Artificial Intelligence and the Creative Industry: New Challenges for the EU Paradigm for Art and Technology by Autonomous Creation' in Woodrow Barfield and Ugo Pagallo (eds), *Research Handbook on the Law of Artificial Intelligence* (Edward Elgar, 2018) 531.
[121] Anne Fitzgerald and Tim Seidenspinner, 'Copyright and Computer-Generated Materials – Is it Time to Reboot the Discussion About Authorship?' (2013) 3(1) *Victoria University Law and Justice Journal* 47, 54.
[122] See, eg, in New Zealand "the person by whom the arrangements necessary for the creation of the work are undertaken": *Copyright Act 1994* (NZ) s 5(2)(a); in India "the person who causes the work to be created": *Copyright Act 1957* (India) (2)(d)(vi); in Hong Kong "the person by whom the arrangements necessary for the creation of the works are undertaken": *Copyright Ordinance* (Hong Kong) cap 528, s 11(3); in Ireland "the person by whom the arrangements necessary for the creation of the work are undertaken": *Copyright and Related Rights Act 2000* (Ireland) s 21(f).
[123] Copyright Law Review Committee, Parliament of Australia, *Computer Software Protection* (Report, 1995).
[124] Copyright Law Review Committee, *Computer Software Protection* (Office of Legal Information and Publishing, 1995) 15 [2.42(c)].

the UK 'necessary arrangements' test be a suitable solution when attributing ownership to works generated by AI?

From the first glance this 'necessary arrangement' test may seem an example of bad drafting. It is rather unclear who is supposed to be the person 'by whom the arrangements necessary for the creation of the work are undertaken'. It could be anyone involved, from the coder, the investor in the computer program, to the user of the computer.[125] The only case that has been decided on this section during the last 30 years does not provide much clarification either.

In *Nova Productions Ltd v Mazooma Games Ltd,*[126] Nova claimed copyright in the bitmap graphics, and the frames generated and displayed to the user when its game was played. Kitchin J found that the programmer of the software was the owner of a computer generated work in the case (composite frames) "*because he devised the appearance of the various elements of the game and the rules and logic by which each frame is generated and he wrote the relevant computer program"*.[127] Kitchin J was satisfied that the programmer was the person by whom the arrangements necessary for the creation of the works were undertaken. However, commentators suggest that such conclusion, although justified in this particular factual scenario, is unlikely to be true in all cases involving computer generated works. Where proximity between programmer and the work in question is more remote, other persons might be the ones who made necessary arrangements, such as the investing company or the user.[128]

[125] Copyright Law Review Committee, n 124, 247 [13.19].
[126] *Nova Productions Ltd v Mazooma Games Ltd* [2006] EWHC 24; [2006] RPC 379.
[127] *Nova Productions Ltd v Mazooma Games Ltd* [2006] EWHC 24; 398–9 [105].
[128] See, eg, Jani McCutcheon, 'Curing the Authorless Void: Protecting Computer-Generated Works following IceTV and Phone Directories' (2013) 37(1) *Melbourne University Law Review* 46, Part III.E.

On the other hand, the lack of clarity means more flexibility. Keeping in mind the emerging nature of the subject matter at stake (computer generated works and, more recently, works created by AI), flexible legal provisions might prove to be helpful in accommodating different industry developments. S 9(3) allows for vesting copyright in different contributors to the works generated by computers/AI, depending on who made the necessary arrangements, be it the coder, the user, or the investor (software company). It also does not preclude the possibility that several persons would be granted ownership to the same work. The provision leaves it to the courts to assess the situation and decide who deserves copyright on a case-by-case basis. Such flexibility is especially desirable in the fields of industry that is still emerging.

In an Australian context, the 'necessary arrangement' test would not be entirely new either. In the case of cinematographic films, *Copyright Act 1968* (Cth) vests copyright in the 'maker' of a cinematographic film.[129] The 'maker' of a film is defined as 'the person by whom the arrangements necessary for the making of the film were undertaken'.[130] According to the established case law, the maker can be the producer/investor in the film, the film director or both of them together, depending on their contributions. For instance, in *Seven Network (Operations) Ltd v TCN Channel Nine Pty Ltd*, both the Seven Network and the director of the film made arrangements necessary for the creation of the film and were both recognised to be owners in the tapes.[131] The existing case law on 'necessary arrangements' test in Australia thus provides at least some legal guidance that the legal community would desire, and at the same time leaves plenty of space for courts to interpret the concept keeping in mind the most recent developments in the field.

[129] *Copyright Act 1968* (Cth) s 98(2).
[130] *Copyright Act 1968* (Cth) s 22(4)(b).
[131] *Seven Network (Operations) Ltd v TCN Channel Nine Pty Ltd* [2005] FCAFC 144, [114]-[117].

VI. CONCLUSION

AI is an emerging technology and its broader adoption and application by creative industries is still in the future to come. However, as creative industries are seeing the first works created by AI entering art markets, it is time to consider copyright implications on these pieces of art. Under current Australian copyright law, works created by AI do not attract copyright protection since copyright law requires a human being to be directly involved in the creation of the work. At the same time, the analysis of utilitarian and natural rights theories that underlie copyright law demonstrate that, at least in certain cases, when human contribution to the creation of a work by AI is sufficiently significant and not too remote from the final output, there might be a good reason to grant copyright protection to such works. This would stimulate human beings to creatively interact with AI systems, which would result in more creative works reaching the public.

The other difficulty is establishing who would be the owner of works created by AI that qualify for copyright protection. After discounting 'no one' and 'AI' as potential options, we suggest that the answer will vary depending on the contribution provided by different human beings involved in the creation of the work. In some cases it might be reasonable to vest copyright into a coder/developer of software (or a team of coders/developers), while in other cases it might be a user (artist) whose contribution would be most directly linked to the final output. For this reason, we suggest considering a broader concept that would encompass different allocation possibilities and provide for a sufficient flexibility to deal with different new emerging scenarios. The UK test of 'necessary arrangements' is one of the possible options as it is both a familiar concept in the Australian copyright system, and enjoys sufficient flexibility necessary when dealing with such new technologies as AI.