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Artificial Authors: Case Studies of Copyright in Works of Machine Learning

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Patrick R Goold*

Abstract

The Article investigates whether creative works produced via machine learning algorithms qualify for copyright protection. Previous research into this question has been largely theoretical. By contrast, the Article introduces four empirical case studies of works produced via machine learning. The Article examines the copyrightability of such works under U.S., E.U., and U.K., law. The Article concludes that such works are sufficiently original to qualify for copyright protection. This conclusion casts into doubt prior literature that finds works of machine learning algorithms to be outside the scope of copyright protection.

Keywords: Copyright, Artificial Intelligence

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Introduction

1 the Road is a novel published in July 2018. In many respects, the book is unremarkable. The work appears on no best sellers' lists. The prose is disjointed and the text contains typographical errors. The story itself — a recounting of a road trip between New York City and New Orleans — is derivative of Jack Kerouac's famous 1957 beat novel, *On the Road*. But despite this, there is something unique about the work: it is the first novel written by a machine.[1] In 2017, Ross Goodwin, technologist and data scientist from New York, connected a surveillance camera, a GPS unit, a microphone, and a clock to a portable laptop programmed with an artificial intelligence (A.I.) algorithm.[2] The laptop and sensors were mounted to a Cadillac car, which Goodwin and friends took on a road trip from Brooklyn to New Orleans.[3] During the trip, the sensors collected information from the outside world and fed it to the laptop, while the algorithm in turn created text narrating their journey.[4] While hardly *War and Peace*, the resulting novel has been described as a work of "pixelated poetry" full of "striking and memorable lines" — such as the opening line quoted above.[5] But perhaps the most surprising aspect of the work appears on the very first page. Before the novel's opening sentence, appears a line written clearly by humans: "© Jean Boîte Éditions." With this line, the publisher claims to be the copyright owner of the work produced by the machine. The question is: Are they right? Are A.I.-created works copyrightable?

1 the Road is one example of the exploding field of literary and artistic works created via artificial intelligence. While the use of computers to create art is itself nothing new, recent developments in the field of machine learning have resulted in algorithms being used to create works in vastly more complex, interesting, and valuable ways than ever before. Art gallery Christie's recently auctioned the "first artwork created using Artificial Intelligence" for $432,500,[6] while a Chelsea gallery claims to have opened the first exhibition of a machine's

[1] Thomas Horngold, *The First Novel Written by AI Is Here – and It's as Weird as You'd Expect It to Be*, SINGULARITY HUB (Oct. 25, 2018), https://singularityhub.com/2018/10/25/ai-wrote-a-road-trip-novel-is-it-a-good-read/#sm.00069qmis10ebdl7uan103cdtwnog.
[2] ROSS GOODWIN, 1 THE ROAD 12 (Jean Boîte Éds. 2018).
[3] *Id.*
[4] *Id.*
[5] Brian Merchant, *When an AI Goes Full Jack Kerouac*, THE ATLANTIC (Oct. 1, 2018), https://www.theatlantic.com/technology/archive/2018/10/automated-on-the-road/571345.
[6] Gabe Cohn, *AI Art at Christie's Sells for $432,500*, THE NEW YORK TIMES (Oct. 29, 2018), https://www.nytimes.com/2018/10/25/arts/design/ai-art-sold-christies.html.

work.[7] IBM's A.I. machine, Watson, is now capable of generating movie trailers as suspenseful as any created by a Hollywood scriptwriter.[8] Computers can create text for sci-fi movies.[9] Musicians are releasing albums "in collaboration" with machines.[10] Elon Musk-backed start-up Open-AI recently released GPT-2 — a software that can create whole paragraphs of coherent prose.[11] Instructional handbooks dedicated to creating works of authorship with AI are now appearing on the market.[12]

A burgeoning literature now exists concerning the copyrightability of such works. The findings of this research are varied. On one hand, an important and perhaps dominant strand of the literature finds that such works are generally not eligible for copyright protection under traditional copyright principles. In order to be copyrightable, creative works must be sufficiently "original."[13] Unlike the novelty requirement in patent law, "originality" refers to a particular type of relationship between the person claiming authorship of the work and the work itself (e.g., in the U.S., that the work involve a "modicum of creativity")[14]. An important strand of the literature finds that, because A.I. created works lack a human "author," the necessary "author-work" relationship cannot exist, and consequently such works cannot be considered original.[15] In response, some jurisdictions have adopted bespoke legislative provisions to govern works created through artificial intelligence. Since 1988, United Kingdom (U.K.) copyright legislation has stated that when a work has "no human author" and is "computer-generated,"[16] then copyright in the work will vest in the person who undertook the "arrangements necessary for

[7] Ian Bogot, *The AI-Art Gold Rush Is Here*, THE ATLANTIC (Mar. 6, 2019), https://www.theatlantic.com/technology/archive/2019/03/ai-created-art-invades-chelsea-gallery-scene/584134.
[8] Amelia Heathman, *IBM Watson Creates the First AI-Made Film Trailer – And It's Incredibly Creepy*, WIRED (Sept. 2, 2018), https://www.wired.co.uk/article/ibm-watson-ai-film-trailer.
[9] Annalee Newitz, *Movie Written by Algorithm Turns Out to Be Hilarious And Intense*, ARSTECHNICA (Sept. 6, 2016), https://arstechnica.com/gaming/2016/06/an-ai-wrote-this-movie-and-its-strangely-moving.
[10] *Proto* HOLLY HERNDON, http://www.hollyherndon.com/proto (Proto official website).
[11] Steven Poole, *The Rise of Robot Authors: Is the Writing on the Wall for Human Novelists?*, THE GUARDIAN (Mar. 25, 2019), https://www.theguardian.com/books/2019/mar/25/the-rise-of-robot-authors-is-the-writing-on-the-wall-for-human-novelists.
[12] DAVID FOSTER, GENERATIVE DEEP LEARNING: TEACHING MACHINES TO PAINT, WRITE, COMPOSE, AND PLAY (2019).
[13] *See, e.g,.* Copyright, Designs and Patents Act 1988, s 1(a) (U.K.).
[14] Feist Publ'ns, Inc., v. Rural Tel. Serv. Co., 499 U.S. 340 (1991).
[15] *See infra* Part II.C.
[16] Copyright, Designs and Patents Act 1988, s 178 (definition of 'computer generated') (U.K.).

the creation of the work."[17] This statutory clause has been replicated in other jurisdictions, while commentators in the U.S. and Australia have expressed interest in the rule as a model for ensuring the copyrightability of such works.[18] On the other hand, a smaller subset of the literature argues that there is no truly "computer-authored work" and that all works created via machine learning can be traced back to some creative input of a human author.[19] To date, however, the legal literature on machine learning works has been purely theoretical.

This Article presents the findings of a qualitative study into works created by machine learning. The Article introduces four case studies: *1 the Road* (by Ross Goodwin), *The Lifestyle of the Richard and Family* (by Roslyn Helper), *Edmond de Belamy* (by Obvious Art), and *I AM AI* (by Tara Southern).[20] The case studies were selected on the grounds that each involves a work of machine learning created in the past five years (and reflects the current state of technology); because they together comprise a broad range of artistic endeavor (literary works, dramatic works, artistic works, and musical works); and because the works were created using a broad array of machine-learning technologies. The author used publicly available information about the works, and interviewed the relevant creators, in order to produce the case studies. The case studies are examined through a doctrinal lens in order to better understand their copyrightability. The primary research question posed is: Are the works are copyrightable under traditional copyright principles?

The Article tentatively pushes back against the literature arguing that works of machine learning are not copyrightable. As demonstrated below, each of the case studies involved a series of creative choices. In producing the studied works, the creators made three different types of choices: "input" choices (about what data to feed the machine learning algorithm), "training" choices (about the operation of the machine learning algorithm), and "output" choices (about what outputs to select and how to present the outputs).[21] These choices were frequently creative in the sense that they were aesthetic judgements unconstrained by utilitarian or functional concerns. The presence of this creativity strongly suggests that the works are original and thus eligible for copyright protection. In turn, the case studies suggest that existing legal scholarship underestimates the amount of human creativity involved in works of machine learning, and underestimates how frequently such works will benefit from copyright under traditional principles. Of course, the study does not demonstrate that all works

[17] *Id*. s 9(3).
[18] *See infra* notes 104-105.
[19] *See infra* Part II.C.
[20] *See infra* Part III.
[21] *See infra* Part IV.

produced via machine learning are eligible for copyright protection. Works of machine learning are highly varied and, just like more traditional works, some will undoubtedly fail the originality threshold. But it does provide some further evidence that machine-learning works, for the time-being, can be accommodated within the existing legal regime without the need for unique legal provision, like that found in the U.K

The Article continues in four Parts. Part II provides background on machine learning and copyright, including a literature review, and explains the methodology involved in the study in further depth. Part III introduces the four case studies. Part IV analyzes the case studies from a doctrinal perspective (focusing on U.S., European Union (E.U.), and U.K. law). Part V concludes by comparing the findings of this study to the findings of prior research, and by highlighting areas for further research in the future. Lastly, a note on terminology is required. The Article refers to the "creators" of the relevant case study works. This label is used as a more neutral and less conclusory term than "authors." The term "creators" is also less cumbersome than other alternative terms (such as "work producers" or "users of machine learning algorithms").

II. BACKGROUND

This Part provides an overview of the topic of machine learning creativity. After discussing briefly the technology required to produce machine learning works, the Part summarizes U.S., E.U., and U.K. law on copyrightability. The Part proceeds to provide a review of the literature on the topic before finally explaining the methodology adopted in this Article.

A. Machine Learning Creativity

The use of computers to create expressive works is far from new. The term "computer art" was coined in the early nineteen sixties to refer to works created through use of a computer.[22] Arguably the first artist in this genre was Manchester University philosophy lecturer, Desmond Paul Henry, who created the "Henry Drawing Machine."[23] This "analogue" computer employed an external electric power source which operated a motor to turn suspended drawing implements over canvas. Henry's work was exhibited in 1962 in the Reid

[22] Edmund Berkley, *Readers' and Editors Forum*, 22 COMPUTERS & AUTOMATION 8 (1963), http://www.bitsavers.org/pdf/computersAndAutomation/196301.pdf (the front cover and the editor's explanation is typically seen as the coining of the phrase "computer art").
[23] Alice Rawsthorn, *When Desmond Paul Henry Traded His Pen for a Machine*, NEW YORK TIMES (Feb. 27, 2011), https://www.nytimes.com/2011/02/28/arts/28iht-design28.html.

Gallery in London.[24] But digital computer art was quick to follow. In 1962, A. Michael Noll programmed computers at Bell Telephone Laboratories in New Jersey to create visual patterns for aesthetic purposes.[25] By 1968, enough computer art existed to enable London's Institute of Contemporary Arts to host an exhibit called "Cybernetic Serendipity," featuring works from the first generation of digital artists, such as Nam Jun Paik, John Whitney, and Charles Csuri.[26] This trend in art, in turn, began to have an effect in copyright. In his Annual Report of 1965, Abraham Kaminstein, U.S. Register of Copyrights, wrote that the U.S. Copyright Office had received several applications which are "at least partly" the work of computers (and he listed an abstract drawing, a musical composition, and several compilations as examples).[27] Despite the historical pedigree of computer art, advancements in machine learning in recent years have had a profound impact on the genre.

"Machine Learning" (a flourishing subset of artificial intelligence) refers to the study of algorithms used to perform a task but without using explicit instructions.[28] Arthur Samuel in 1959 defined machine learning as the field of study that "gives computers the ability to learn without being explicitly programmed."[29] For example, a machine learning algorithm may be shown a symbol (e.g. the number "3") and be able to recognize what that symbol means (that the symbol "3" means "three" in the Hindu-Arabic numeral system) without explicitly being told. Or the machine may be given an image of a skin mole and the algorithm can accurately classify it as benign or malignant.[30] To make such predictions, the algorithm must first be "trained" on a sample of "training data."[31] Through the training process, the algorithm builds a statistical model which forms the basis of the decision making process.[32] There are a number of ways

[24] Eric Newton, ***Ideographs at the Reid Gallery***, *MANCHESTER GUARDIAN,* Aug. 31, 1962.
[25] Michael A. Noll, *Computers and the Visual Arts*, *in*, DESIGN AND PLANNING 2: COMPUTERS IN DESIGN AND COMMUNICATION 65-79 (Martin Krampen & Peter Seitz eds., 1967).
[26] *Cybernetic Serendipity: A Documentation*, INSTITUTE OF CONTEMPORARY ART, https://archive.ica.art/whats-on/cybernetic-serendipity-documentation (last visited Jan. 29, 2020).
[27] UNITED STATES COPYRIGHT OFF., SIXTY-EIGHT ANNUAL REPORT OF THE REGISTER OF COPYRIGHTS FOR THE FISCAL YEAR ENDING JUNE 30, 1965, at 5 (1966).
[28] For a general introduction to the technical workings of machine learning, see GOPINATH REBALA ET AL, INTRODUCTION TO MACHINE LEARNING 1-5 (2019). For introduction to the interaction of AI with the law, see RESEARCH HANDBOOK ON THE LAW OF ARTIFICIAL INTELLIGENCE (Woodrow Barfield & Ugo Pagallo eds, 2018).
[29] Arthur L. Samuel, *Some Studies in Machine Learning Using the Game of Checkers*, 3 IBM J. RES. DEVELOP. 210 1959). More recently Tom Mitchell provided a more modern definition: "*A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E." THOMAS MITCHELL, MACHINE LEARNING 2 (1997).*
[30] Andre Esteva and Eric Topol, *Can Skin Cancer Diagnosis Be Transformed by AI?*, LANCET PERSPECTIVES (Nov.16, 2019), https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32726-6/fulltext.
[31] Rebala, *supra* note 28, at 19-22.
[32] *Id.*

in which this training or learning process takes place, but the two most commonly discussed are "supervised" and "unsupervised" learning.[33] In the former, the algorithm is given both inputs and outputs. For example, a computer may be shown hundreds of thousands of numbers ("inputs") alongside labels stating what those symbols mean ("outputs"). The training data demonstrates that the symbol 3 (input) means "three" (the output). From this data, the algorithm builds a statistical model, so that in the future if it is shown a new input (e.g. a symbol 3 in a different font or handwriting), it will be able to accurately predict the output on its own (i.e. that the relevant symbol means "three"). Alternatively, in "unsupervised learning" the machine is only given inputs (and no outputs.) From this data, the machine identifies patterns in the data (perhaps even patterns humans would not detect), which are then used as the basis of future predictions.

Machine learning typically (although not exclusively) involves a specific class of algorithm called "neural networks" (or "artificial neural networks"). These algorithms inspired by the biological neural networks in the human brain were initially created by computer scientists trying to perform tasks with which conventional algorithms had little success[34]. Such algorithms are composed of a series of interconnected units ("nodes") which can send signals back and forth. The most recent, and to date most important development within this field, was the creation of the "Generative Adversarial Network" (GAN) by Ian Goodfellow in 2014.[35] The GAN is composed of two artificial neural networks — a "generative network" and a "discriminator network."[36] These two networks compete with each other in a game. Let us say the task of the network is to produce realistic photographs of humans. Both networks are given a set of training data (pictures of real humans). The task of the generative network is to create new pictures of humans. The discriminator network reviews the outputs of the generative network, and assesses whether this is output is a real human (i.e., a picture from the initial data), or a forgery (i.e. a creation of the generative network). The game is completed when the generative network can produce outputs that are good enough to fool the discriminator network (i.e., generate pictures which the discriminator believes to be part of the original training data).[37] At this point, the network can then be used to produce thousands of new photos.

[33] Other types of learning algorithm (e.g., reinforcement learning, self-learning, feature learning) can be glossed over at this point. Rebala, *supra* note 28, at 22.
[34] Rebala *supra* note 28, 105-06.
[35] Ian Goodfellow et al, *Generative Adversarial Nets*, PROC. INT'L CONFERENCE ON NEURAL INFO. PROCESSING SYS. 2672 (2014).
[36] *Id*.
[37] *Id*.

By training neural network on creative works, an algorithm can learn the features of those works and produce works in a similar style.[38] The first known example of such "style transfer" occurred in 1989 when Peter Todd trained neural networks to reproduce musical melodies, and by changing the network's parameters slightly, was able to generate new music.[39] But a more recent example can be found in Google's Deep Dream Generator.[40] By training the algorithm on styles of painting, the algorithm can take a user-uploaded photograph and reimagine how it would look like in a given style (see figure 1 for example). Or, as we shall see with the *1 the Road* example, Goodwin was able to train the algorithm on a range of literary works, such that when the algorithm was fed with information from the various sensors, the machine was able to construct those raw inputs into prose in the same style as the training data. Today, with the backing of Google,[41] Elon Musk,[42] and with a range of online tools teaching artists how to use neural networks, we have witnessed a "Gold Rush" to make advancements in the field of AI creativity.[43]

Figure 1: Deep Dream[44]

B. The Law of Copyrightability

Copyright in the United States exists in "original works of authorship" fixed in a tangible medium.[45] Whether a work is "original" depends on its ability to meet the test laid down in *Feist Publications v. Rural Telephone Service.*[46] Prior to *Feist*, the prevailing originality

[38] Foster, *supra* note 12, at 153-54.
[39] Peter M. Todd, *A Connectionist Approach to Algorithmic Composition*, 13 COMPUTER MUSIC J. 27 (1989).
[40] DEEP DREAM GENERATOR, https://deepdreamgenerator.com (last visited Jan. 29, 2020).
[41] ARTISTS AND MACHINE INTELLIGENCE, https://ami.withgoogle.com (last visited Jan. 29, 2020).
[42] OPENAI, https://openai.com, (last visited Jan. 29, 2020).
[43] Bogot, *supra* note 7.
[44] Content image: The Tübingen Neckarfront by Andreas Praefcke, Style painting: "Head of a Clown", by Georges Rouault. Combined image taken from Vincent Dumoulin et al, *Supercharging Style Transfer*, GOOGLE AI BLOG (Oct. 26, 2016), https://ai.googleblog.com/2016/10/supercharging-style-transfer.html.
[45] 17. U.S.C. § 102(a).
[46] 499 U.S. 340 (1991).

standard was the "Sweat of the Brow" test, under which copyright would be acquired if sufficient labor was involved in the work's creation. According to the new standard in *Feist*, a work will be original if its generation involved a "modicum of creativity."[47] While the standard of creativity is "extremely low"[48] according to the Supreme Court, there must nevertheless be a "spark"[49] or "minimal degree"[50] of creativity in order to be protected. The creativity requirement is "objective" in the sense that the artistic merit or worth of the work is not important;[51] the only requirement is that the author makes aesthetic choices unconstrained by functional or utilitarian concerns.[52]

U.S. courts have not provided a definition of the term "authorship."[53] Rather than provide a separate "authorship" standard, "originality" generally provides the focus for judicial analysis. Rather than existing as two analytically distinct concepts, originality and authorship are, in current doctrine, intractably fused (or perhaps confused),[54] to the point that some courts, arguably, view "authorship" as a label attached to anyone who supplies "originality." In response, some scholars have tried to deduce principles of authorship from existing law[55] or simply proposed a new authorship standard.[56] These principles have not, as of yet, been clearly endorsed by courts. Nevertheless, assuming a work is protected by copyright, then the

[47] *Id*.
[48] *Id*., at 343.
[49] *Id*.
[50] *Id*.
[51] Bleistein v. Donaldson Lithographing Co. 188 U.S. 239 (1903).
[52] Mazer v. Stein, 347 U,S, 201 (1954).
[53] Jane C. Ginsburg, *The Concept of Authorship in Comparative Copyright Law*, 52 DEPAUL L. REV. 1063, 1066 (2003) ("Few judicial decisions address what authorship means, or who is an author."); Christopher Buccafusco, *A Theory of Copyright Authorship*, 102 VA. L. REV. 1229, 1231-32 (2016) (arguing that copyright doctrine requires that a work be original, creative, and fixed to be protected by U.S. copyright law, but that this needs to be supported by a separate concept of authorship, which has so far not been articulated). Although philosophers and historians have paid more attention to the concept of authorship. *See* Peter Jaszi, *Toward a Theory of Copyright: The Metamorphoses of "Authorship"*, DUKE L.J. 455 (1991); Oren Bracha, *The Ideology of Authorship Revisited: Authors, Markets, and Liberal Values in Early American Copyright*, 118 YALE L.J. 186 (2008).
[54] As an illustration of this fusing, see David Nimmer, *Copyright in The Dead Sea Scrolls: Authorship and Originality*, 38 HOUS. L. REV. 1, 7-10 (where the section "In pursuit of the Originator" identifies the author as the person to whom the work owes its "origin"). *See also* 2 WILLIAM PATRY, PATRY ON COPYRIGHT § 5:14 (2020) (writing that "Feist Publications, Inc. v. Rural Telephone Service Co. … grounded authorship in the constitutional requirement of originality…").
[55] Jane C. Ginsburg & Luke Ali Budiardjo, *Authors and Machines*, 34 BERKELEY TECH. L.J. 343, 347 (2019) (deriving "general principles of authorship from copyright cases;" the general principles requiring a detailed conception of the work and a physical execution of the work).
[56] Buccafusco, *supra* note 53 (proposing an authorship standard whereby the putative author must "intend to produce some mental effect in an audience").

initial ownership of the work will be allocated to the "author."[57]

In this study, the potentially difficult issue of "derivative works" will be largely bracketed. The U.S. Copyright Act defines a derivative work as a "work based upon one or more pre-existing works."[58] To the extent that a work is derivative, it cannot be considered an original work.[59] Furthermore, a copyright owner has the right to prevent the creation of unauthorized derivative works.[60] Lawyers have not reached consensus regarding the scope of this provision, and one treatise finds the case law on the topic to be "fast approaching incomprehensibility."[61] Nevertheless, it is clear that works based on pre-existing ideas are not derivative works, and nor are works that "incorporate insubstantial amounts from pre-existing works."[62] This provision suggests an important question: by training an algorithm on pre-existing copyrighted works, and by using that trained algorithm to create a new work, does the operator of the algorithm create an unlawful derivative work which, to the extent it is derivative, cannot be considered original? This Article largely does not answer this question. It assumes that the case studies are not derivative of any pre-existing works, and ergo are all capable of being original works. This decision is made for a number of reasons. Partly, this is because the author does not have access to the entirety of the works upon which the machine learning algorithms were trained, and is thus in no position to analyze whether the resulting works are derivative. Partly it is because, in the author's estimation, the case studied works are likely not to be considered derivative and, on the balance of probabilities, they involve insubstantial incorporation of prior expression. But most significantly of all, engaging in this question would not clearly serve the research aims. Examining whether the works are derivative, in a legal sense, does not shed light on whether the production process behind the case studies and whether that involved creative choices. Our study can analyze whether the case studied works involved creative choices or not without wading into the legally complex territory of derivative works.

In order to be an original copyrightable work in the E.U., the work must be the "author's own intellectual creation." This test was laid down in the Court of Justice of the European

[57] 17 U.S.C. § 201
[58] 17. U.S.C. § 101 (derivative work definition).
[59] *See* Gracen v. Bradford Exch. & MGM, 698 F.2d 300 (7th Cir. 1983) (finding that the plaintiff's work — a painting based on Judie Garland in the Wizard of Oz — was derivative of the MGM movie and thus not original and copyrightable).
[60] 17. U.S.C. § 106(2).
[61] 2 PATRY, *supra* note 54, § 3:46.
[62] *Id*. § 3:47.

Union (C.J.E.U.) *Infopaq* case.[63] Subsequent courts have further elaborated that, in order to be the author's own intellectual creation, the work must involve the "personal touch"[64] of the author, and must result from the author's "free and creative choices."[65] Furthermore, in *Painer*, Advocate-General Trstenjak wrote that "only human creations are … protected,"[66] although admitting that this included cases where a human "employs a technical aid, such as a camera."[67] The references to "intellectual creation" and "personal touch" might suggest a higher threshold of originality than in the U.S. However, this is not an inevitable conclusion. The C.J.E.U. has not explicitly stated how difficult the standard is to achieve (unlike the U.S. Supreme Court which has stated the threshold is "extremely low"). Furthermore, certain decisions suggest the level of creativity is not significant. For example, in *Infopaq*, the C.J.E.U. agreed that a string of eleven words could be sufficiently original to receive copyright protection. Lastly, E.U. law, even more noticeably than U.S. law, ties together the concepts of authorship and originality by including the former concept within the definition of the latter.

As part of the E.U. for many decades, the U.K. also follows the E.U. "intellectual creation" standard.[68] However, U.K. copyright law departs from E.U. in one very significant, and one moderately significant, way. First, U.K. law has, since 1988, adopted a unique provision relating to "computer-generated works." In cases where there is "no human author" and works are instead "computer-generated,"[69] the statute states that the "author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken"[70] (this provision has subsequently been adopted in Ireland[71] and New Zealand[72]). To date, courts have only applied the section once (and, even then, the court did not spend significant time interpreting the provision). In *Nova Productions Ltd v. Mazooma Games Ltd & Ors*, it was held that the visual display produced on screen by an arcade game was a graphic work created by the programmers of the game, rather than the users of the game.[73] L.J. Jacob supported this conclusion on the grounds that the user's contribution was not "artistic in nature" (it involved no "skill or labour of an artistic kind") and that the user had not "undertaken any of

[63] Infopaq Int'l A/S v. Danske Dagblades Forening, [2009] ECR I-6569 (E.U.).
[64] Case C-145/10, Eva-Maria Painer v Standard Verlags GmbH, [2012] ECDR 6 (E.U.).
[65] *Id.*
[66] Eva-Maria Painer n.71; Opinion of AG Trstenjak para 121 (E.U.).
[67] *Id.*
[68] Temple Island Collection v. New English Teas, [2011] EWPCC 1 (U.K.).
[69] Copyright, Designs and Patents Act 1988, s 178 (U.K.).
[70] *Id.* s 9(3).
[71] Copyright and Related Rights Act 2000 s 21(f) (Ire.).
[72] Copyright Act 1994 s 5(2)(a) (N.Z.).
[73] Nova Prods., Ltd v. Mazooma Games, Ltd., [2006] EWHC 24 (Ch) (U.K.).

the arrangements necessary for the creation of the frame images."[74] Although questions regarding who has undertaken the necessary arrangements for a work's generation (the programmer or user of an algorithm) persist,[75] it is interesting to note that L.J. Jacob tied the concept of "arrangements" to the originality standard (i.e. skill and labour of an artistic kind). The statute does make clear, however, that, whoever has made the necessary "arrangements" will receive economic rights only, and does not receive moral rights protection.[76] Second, until the 2009 C.J.E.U. *Infopaq* decision, the U.K. followed an alternative originality standard. Historically, a work would be considered "original" if the putative owner produced the work through the application of "skill, labor, and judgement"[77] (sometimes "skill, labor, *or* judgment"[78] and at times just "skill and labor"[79]). This standard was traditionally easy to satisfy, as demonstrated by famous case law holding that the addition of punctuation, corrections and revisions to public speeches was a sufficiently original contribution to give rise to a copyrightable work. [80] Prior to the U.K.'s departure from the E.U., debate existed concerning how significantly the copyrightability test in the U.K. was altered by *Infopaq*, with some courts finding the two tests to be largely equivalent.[81]

Lastly, in none of the above jurisdiction exists a formal "causal" connection requirement. In non-digital environments, the causal connection between an author and her work is typically straightforward. A painter causes the production of the work through application of paint to canvas, for example. A defining feature of works of machine learning is that the connection between the author and the work may be slightly more attenuated. The presence of an algorithm between the author and the ultimate work complicates the causal relationship.[82] In part, this is due to the unpredictability of the algorithm. While the author may train the algorithm in a certain way, there will nevertheless be some uncertainty ex ante about the outputs it creates. Unlike the painter example, the creator potentially does not have full control over the resulting output. This is, of course, not entirely a feature of machine learning works. Cases like the infamous Monkey Selfie case (where a photographer left a camera with

[74] *Id.* para. 106.
[75] Andres Guadamuz, *Do Androids Dream of Electric Copyright? Comparative Analysis of Originality in Artificial Intelligence Generated Works*, 2 I.P.Q. 169, 177 (2017).
[76] Copyright, Designs and Patents Act 1988, s 79, s 81 (U.K.).
[77] Walter v. Lane, [1900] AC 539 (U.K.), Ladbroke v. William Hill, [1964] 1 All ER 465 (U.K.).
[78] Interlego v. Tyco. [1988] RPC 343, 371 (U.K.).
[79] Andreas Rahmatian, *Originality in UK Copyright Law: The Old "Skill and Labor" Doctrine Under Pressure*, 44 IIC: INT'L REV. INTELL. PROP. & COMPETITION L. 4 (2013).
[80] *Walter*, AC 539.
[81] Temple Island Collection v. New English Teas, [2011] EWPCC 1, 20 (HHJ (U.K.) (Briss, Q.C.) finding that there was "little difference in approach" between the intellectual creation and skill and labor tests).
[82] Ginsburg & Budiardjo, *supra* note 55, at 350.

a group of macaque monkeys, one of whom used it to take a selfie), posed similar difficulties.[83] In cases where the relationship between putative author and resulting work become more tenuous, questions of authorship naturally arise. In response, some scholars have suggested that copyright adopt a more explicit "causal" connection requirement.[84] However, to date, such a requirement has not been endorsed by courts or legislatures. The only requirement for copyrightability is that a work be an original work of authorship (with originality, rather than authorship, playing a more dominant conceptual role).

C. Literature Review

U.S. scholars have considered the copyrightability of A.I. produced work from a doctrinal perspective. The conclusions have, however, been varied. In one of the earliest assessments of copyright in works produced by neural networks, Ralph Clifford argued that in order to be protected, an expressive work must involve human-supplied originality.[85] As many computer-generated works do not involve such originality, then the work "presumably enters the public domain."[86] This view has been adopted by the U.S. Copyright Office that currently requires works to be "created by a human being" in order to be registered in the Copyright Register.[87] Finding that such works are not protected by existing copyright law, some scholars propose law reform. Bruce Boydon, for example, proposes a new "test" for copyrightability in relation to such works.[88] Boydon argues that if a "person could predict the work's content with reasonable specificity before it is rendered or received by the user" then it that person ought to enjoy copyright in the work.[89] In a related vein, Peter Denicola challenges the Copyright Office's human-authorship requirement on normative grounds, who argues that incentivizing the creation of new works should include incentivizing the creation of machine-authored works as well.[90]

However, not all scholars have concluded that such works are not protected under existing U.S. copyright law. In particular, Annemarie Bridy cites cases involving psychography (i.e. a psychic ability to allow a spirit to use one's body to write words) for the claim that human

[83] Naruto v. Slater, No. 16-15469 (9th Cir. Apr. 23, 2018).
[84] Shyamkrishna Balganesh, *Causing Copyright*, 117 COLUM. L. REV. 1 (2017).
[85] Ralph Clifford, *Intellectual Property in the Era of the Creative Computer Programme*, 71 TULANE L. REV. 1675 (1997).
[86] *Id.* at 1695.
[87] UNITED STATES COPYRIGHT OFF., COMPENDIUM OF U.S. COPYRIGHT OFFICE PRACTICES, s 306 (3d ed, 2014).
[88] Bruce Boyden, *Emergent Works*, 39 COLUM. J. LAW & ARTS 377 (2016).
[89] *Id*. at 379.
[90] Robert Denicola, *Ex Machina: Copyright Protection for Computer-Generated Works*, 69 RUTGERS U. L. REV. 251 (2016).

authorship is not necessary for creation.[91] Following these cases, Bridy argues that U.S. copyright does not require human creativity, so long as there is a sufficient "nexus" to human creativity,[92] which A.I. produced works may satisfy. This view is echoed by James Grimmelmann who has argued that there is "no such thing as a computer-authored work."[93] Although Grimmelmann agrees that computer-*generated* works exist, a number of factors prevent these from being considered as "authored" by the computer (e.g. "programmers as well as users contribute to them") and instead they are more accurately understood as authored by humans.[94] But the most recent, and perhaps most significant, expositors of this view are Jane Ginsburg and Luke Ali Budiardjo. Ginsburg and Budiardjo claim that even "the most technologically advanced machines of our era are little more than faithful agents of the humans who design or use them"[95] because all outputs of a machine can ultimately be traced back to the instructions provided by humans. Accordingly, these scholars claim that "can a machine be an author?" is the "wrong" question, while the more "appropriate" or pressing question is to which human ought authorship be attributed, particularly in cases where multiple individuals (upstream programmers and downstream users of machines) together contribute to the ultimate creation of a work (a question which, as we shall see, has particular relevance in the U.K.).[96]

E.U. focused literature is less developed than U.S. literature. But at this stage, scholars have largely concluded that under the *Infopaq* standard, copyright would not be obtained. Ana Ramalho finds that the references to "personality" in E.U. law "seem to highlight the need for a human author of the work."[97] Likewise, Andres Guadamuz writes that it is "inescapable to conclude that not only does the author need to be human, the copyright work must reflect the

[91] Annemarie Bridy, *Coding Creativity: Copyright and the Artificially Intelligent Author*, 5 STAN. TECH. L. REV. 18-21 (2012).
[92] *Id*.
[93] James Grimmelmann, *There's No Such Thing as a Computer-Authored Work – And It's A Good Thing, Too*, COLUM. J.L. & ARTS (2015).
[94] *Id.* at 404.
[95] Ginsburg & Budiardjo, *supra* note 55, at 343 (although, also finding that some works can be "authorless" rather than machine-authored or human-authored).
[96] *Id.* A criticism of this literature may, however, be that it focuses too greatly on the question of "who is the author?" without devoting sufficient attention to the question of whether the work sufficiently "original" to receive copyright protection? At times, literature arguing that works of machine learning are not computer-authored assumes the works are sufficiently "original" to receive protection, and then quickly proceeds to ask who is the author and thus owner of the resulting property. Yet questions of originality often play a more important role in judicial analysis than questions of authorship.
[97] Ana Ramalho, *Will Robots Rule the (Artistic) World? A Proposed Model for the Legal Status of Creations by Artificial Intelligence Systems*, J. INTERNET L. 1, 8 (2017).

author's personality."[98] Finally, Pinto concludes that when there is no human author, then "there will be no copyright under the E.U. originality test."[99] Nevertheless, these authors do not consider in significant detail exactly how much human involvement would be required in a work's creation, in order for the work to be considered "human-authored."

By virtue of the unique computer-generated works clause, U.K. law is in a distinct position from both U.S. and E.U. law. Guadamuz calls the law "deceptively straightforward."[100] Guadamuz understands the U.K.'s computer-generated works clause as an "exception" to the originality principle.[101] Accordingly, computer-generated works are protected, somewhat clearly, under U.K. law, although questions remain about in whom the copyright vests (the programmer or the user of a program).[102] Commentators have largely praised this provision on the ground that it simplifies and clarifies the copyright status of such works. Guadamuz, for example, suggests that the U.K. provision should be "adopted more widely."[103] Commentators outside the U.K., in both the U.S.[104] and Australia[105] have expressed interest in adopting a similar model of protection.

Prior literature is similar in two important respects. The above literature provides a theoretical-doctrinal analysis of the issue of works of machine learning. The prior literature is doctrinal in the sense that it makes claims about the application of law to the phenomenon of machine learning works (although significant differences exist in the methodological assumptions underlying the authors' doctrinal analyses). Furthermore, the literature is purely theoretical. The works are not "empirical" in the sense that they involve no substantial new

[98] Guadamuz, *supra* note 75, at 178.
[99] Timothy Pinto, *Robo ART! The Copyright Implications of Artificial Intelligence Generated Art*, 30 ENT. L. REV. 174, 177 (2019).
[100] Guadamuz, *supra* note 75, at 175.
[101] *Id*. at 177.
[102] *Id.*
[103] *Id*. at 186; *see also* Lionel Bently, The UK's Provisions on Computer-Generated Works: A Solution for AI Creations? (European Copyright Society Conference, Brussels, May 2018) https://europeancopyrightsocietydotorg.files.wordpress.com/2018/06/lionel-the-uk-provisions-on-computer-generated-works.pdf (last visited Jan. 30, 2020) (power point slides) ((questioning whether the U.K.'s provision could serve as a "useful model" for other jurisdictions); *see also* Enrico Bonadio & Luke McDonagh, *Artificial Intelligence as Producer and Consumer of Copyright Works: Evaluating the Consequences of Algorithmic Creativity*, 20 I.P.Q. 112 (2020) (calling the provision a "pragmatic" approach).
[104] Bridy, *supra* note 91, at 26-27 (expressing interest in the model).
[105] Jani McCutcheon, *The Vanishing Author in Computer-Generated Works: A Critical Analysis of Recent Australian Case Law*, 36 MELB. U. L. REV. 915 (2012).

data-gathering.[106] Instead, prior research relies exclusively on reported legal cases as the subject of analysis. This method is the usual starting point in legal research, but yet, has clear limitations. It is difficult to judge the copyrightability of machine-learning works using this methodology when no real world controversies have come before the courts. As a result, the prior studies are necessarily speculative. Without a set of works produced by machine learning to examine in detail, the research attempts to apply copyright principles to a somewhat abstract notion of machine learning works.

In contrast to prior literature, the present Article is empirical and doctrinal. As with prior literature, the aim is to make claims about how the law applies in cases of machine learning. But compared to prior literature, the current Article does not examine exclusively reported legal cases. Instead, the current research selected four works of machine learning and investigated the production process involved in each work. Like the prior literature, the current Article analyzes how copyright law applies in these cases. But unlike prior literature, by examining four case studies, this research is less abstract, provides more opportunities for depth of analysis, and may yield more concrete conclusions. By adopting the case study method, this Article is more akin to the type of scenario faced by judges in real world litigation. This study, furthermore, is to date the only empirical analysis of works produced by machine learning in legal literature.

D. Methodology

The case studies were selected by the author in the following manner. First, the study sought to identify one literary work (a.k.a. one non-dramatic literary work), one artistic work, one dramatic work (a.k.a. one dramatic literary work), and one musical work. These four types of creative works represent, in many jurisdictions, the most recognizable and significant sub-types of copyrightable subject matter.[107] Second, to be part of the study, the works had to be produced in the last five years (i.e., from January 2015 to January 2020). This ensured that the case studies accurately represent the current state of technology. Similarly, the author wished to study works which were created through a diverse range of technologies (as opposed to four works created using the same or similar machine learning algorithms).

[106] *See* Peter Cane & Herbert, *Introduction*, *in* THE OXFORD HANDBOOK OF EMPIRICAL LEGAL RESEARCH 4 (Peter Cane & Herbert Kritzer eds., 2010) ("For our purposes, "empirical" research involves the systematic collection of information ("data") and its analysis according to some generally accepted method").

[107] *See, e.g.*, Copyright, Designs, and Patents Act 1988 ss. 3-8 (U.K.) (making a distinction between creative literary, dramatic, artistic and musical works, and other "entrepreneurial" works, such as sound recordings, typographical arrangements, and broadcasts).

A preliminary list of candidate works was formed using Google search engine. The author identified possible candidates by searching for "creative works" produced by machine learning. The author reached out to possible candidates with a request for interview. The request and accompanying participant information document made clear that no compensation was offered for taking part in the study and that the study would analyze the copyrightability of the relevant works. The use of Google to find the participants has clear advantages and disadvantages. The use of Google was advantageous in the following ways: the author could identify works which had received news attention for breaking new ground in the field of A.I. and creativity, and the author could identify creators from a very wide range of geographical locations. A feature of this process (which may be an advantage or a disadvantage), was the study focused on works which are traditionally associated with creativity. For example, if one uses Google to search for "machine learning and creativity," it is likely that works like *1 the Road* would appear in the search terms, but it is less likely that the search terms would provide information about an individual using a pre-trained algorithm to translate C.J.E.U. court decisions. Similarly, a potential drawback of the Google method is that the author's preliminary list of potential candidates primarily consisted of individuals who already conceived of their work as "artistic" or "creative."

With one notable exception, the author proceeded to interview the study participants. In the case of *1 The Road, The Lifestyle of the Richard and Family*, and *Edmond de Belamy*, the author conducted a one-hour semi-structured interview using Skype or Zoom. In the case of *Edmond de Belamy*, the study interviewed only one of the three creators of the work (who was designated by the group to conduct the interview). The conversations were transcribed and subject to classical content analysis (seeking to organically identify common themes in the materials).[108] This material was supplemented by information made publicly available online by the relevant creator. While this methodology was proposed in relation to the fourth case study, *I AM AI*, personal circumstances of the participant ultimately prevented its execution. In this case study, the creator of the work instead provided answers to written questions. The written answers were subject to the same content analysis as the three other case studies. While this concededly means that the four case studies were not subject to precisely the same method of data collection, the impact of this difference is limited in the context of this study. The study does not necessarily seek to draw comparisons between the case studies, and accordingly, the need for ensuring consistency of data-gathering method is less significant. The overriding methodological requirement is that each participant provide a faithful account

[108] *See* Lisa Webley, *Qualitative Approaches to Empirical Legal Research*, *in* Cane & Kriter, *supra* note 106, at 941 (classical content analysis).

of the production process for their works which can then be subject to doctrinal analysis. This goal could be accomplished by either oral or written answers to questions.

In Part IV the case studies are subject to doctrinal analysis. Doctrinal analysis is a contested field. Disagreement exists about, in particular, the nature and sources of law. While Positivists argue that law is social fact and a product of socially produced rules,[109] Interpretivists and Natural Law scholars see morality as a free-standing source of law.[110] Besides the question of the nature and sources of law, further disagreement exists regarding the ability of those sources to provide a determinate answer in concrete cases. While ardent Formalists argue that law always, or nearly always, yields a unique answer,[111] Legal Realists argue that law is inherently indeterminate and accordingly, in all but the easiest cases, how law applies to concrete scenarios is affected by non-legal factors (including ideology and personality).[112] While not wading into this methodological debate, the analysis provided in Part IV may be understood as Positivist and moderately-Realist.[113] That is, the "law" which it seeks to apply to the cases is that which has been clearly elucidated by legislature and courts (morality is not considered). Furthermore, while acknowledging a role for discretion in the application of law, particularly in hard cases, the analysis assumes legal rules have some determinate application. On this basis, we can make reasonable predictions about the likelihood that a court will find a given work will be protected by copyright or not.

III. CASE STUDIES

This Part introduces the case studies and summarizes the main themes that emerged from the interviews and content analysis. While this Part does not engage in a doctrinal analysis of the case studies, it does highlight information which will be salient to such analysis later.

A. 1 the Road

1 the Road began life when Ross Goodwin was writing his master's thesis at New York University.[114] An economist by training, and a previous speech writer for the Obama campaign, Goodwin turned his attention to machine learning and creativity. His master's

[109] *See* H.L.A. HART, THE CONCEPT OF LAW (1961).
[110] *See* RONALD DWORKIN, LAW'S EMPIRE (1986); JOHN FINNIS, NATURAL LAW AND NATURAL RIGHTS (1980).
[111] Brian Leiter, *Positivism, Formalism, Realism*, 99 COLUM. L. REV. v (1999)
[112] *Id.*
[113] A position that aligns well with Hart, *supra* note 109.
[114] Merchant, *supra* note 5.

thesis, entitled *Narrated Reality* involved Goodwin walking around New York City with a backpack, containing a compass, a punch clock, and a camera.[115] These sensors fed inputs to an algorithm made up of "Long Short Term Memory Neural Networks."[116] The algorithm then produced "weird associative poetry" as an output.[117] While completing his master's thesis, Goodwin began to toy with the idea of whether a car could write a novel.[118] Could a car, for example, write a pastiche of Jack Kerouac's *On the Road*? The success of the master's thesis attracted the interest of Google's Artists and Machine Intelligence Project, who sponsored his next endeavor, *1 the Road*.[119]

Goodwin used the same algorithm to create *1 the Road* as was previously used in relation to *Narrated Reality*. Over the course of a year, Goodwin trained the algorithm on a new data set. Although the goal was to write a novel that paid homage to Kerouac, Goodwin decided against training the machine on Kerouac's work or even other beatnik authors, as being "too on the nose."[120] Instead Goodwin's training data was a mix of poetry, science fiction, and "bleak" writing.[121] The "bleak" writing in particular came from a list of book recommendations by a Polish painter that Goodwin admired[122] (Goodwin says he wanted the book to have "the brain of a painter"[123]). In total, the algorithm was given twenty million words to train upon.[124] Together, this training data "represented the voice [Goodwin] wanted the book to be written in";[125] it was "one that [Goodwin] thought would match the terrain of the journey, its historical and literary significance."[126] During this time, Goodwin tested the algorithm's outputs in two ways. First, the text which was produced was assessed qualitatively by Goodwin on a micro-level, determining whether the text was "good."[127] In addition, Goodwin used a statistical method of testing the outputs.[128] Prior to training, a portion of the training data was set aside as "validation data." Goodwin then statistically tested the variation between the outputs and this validation data to determine the similarity of outputs.[129]

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[115] *Id*.
[116] *Id*.
[117] *Id*.
[118] *Id*.
[119] *Id*.
[120] Interview with Ross Goodwin (Skype interview Sept. 23, 2019) (transcript on file).
[121] Merchant, *supra* note 50.
[122] Goodwin Interview, *supra* note 120.
[123] *Id*.
[124] Merchant, *supra* note 5.
[125] *Id*.
[126] *Id*.
[127] Goodwin Interview, *supra* note 120.
[128] *Id*.
[129] *Id*.

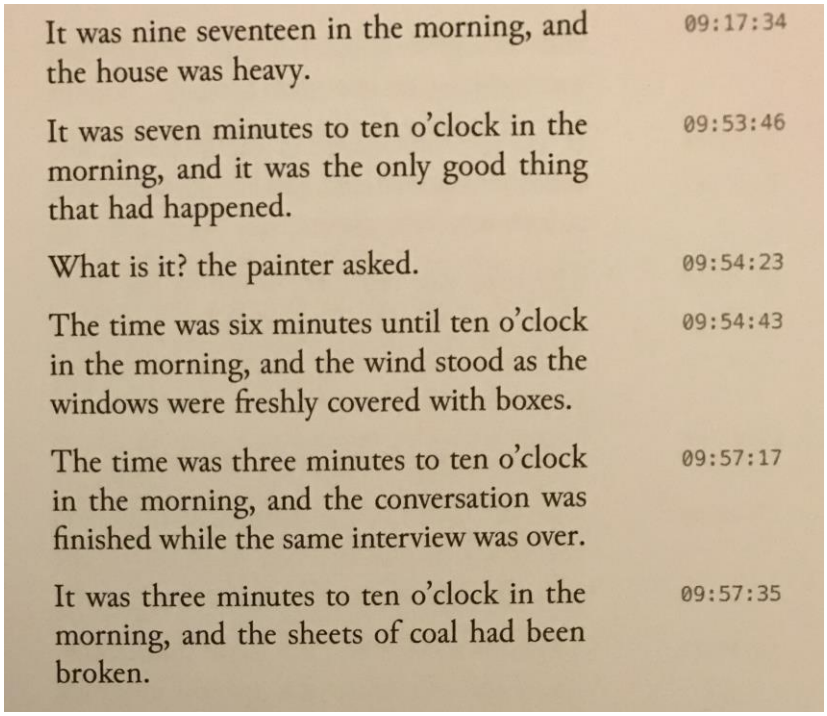
Once the training was complete, the next stage was more mechanical. The car needed to be fitted with the four sensors: a GPS unit to track the car's location; an internal clock to tell the time and date; a surveillance camera mounted on the trunk to monitor passing scenery; and a microphone picking up conversations inside the car. Goodwin then devised a 1,000 mile route which would take the car from Brooklyn to New Orleans. The exact route taken in *On the Road* could not be replicated due to changes in the interstate highway system since its publication in 1957.[130] Planning the route also involved selecting appropriate stopping points along the way. All of which had to be considered carefully, as this may affect the output of the machine. To illustrate, one of the stop off point along the route was at a house which was said to be haunted, to see what the algorithm would make of the unusual location.[131]

Figure 2: Goodwin Preparing[132]

The journey took place over four days. The opening line ("It was nine seventeen in the morning, and the house was heavy") was created before the car had left its starting point in Brooklyn. In this instance, the clock registered the time, which sent the data to the algorithm, which then produced this output. Along the journey, the algorithm turned various inputs into output text. The GPS unit caught latitude and longitude coordinates (e.g. "35.415579526 N, -77.999721808 W, at 154.68504432 feet above sea level, at 0.0 miles per hour, and the first flat of the story in the country is the first in part of the world"[133]), the surveillance camera caught images (e.g., "A ski tree in the background was silent and soft and melancholy"[134]), and the microphone picked up on the passenger's conversation (e.g., "I somewhat when i'm on why i

[130] *Id*.
[131] *Id*.
[132] Content Copyright: David Smoler.
[133] Goodwin, *supra* note 2.
[134] *Id*. at 96.

didn't get hurt yeah my car is an every down i know?"[135]). After which the outputs were printed on rolls of receipt paper. The resulting product is illustrated in figure 3.



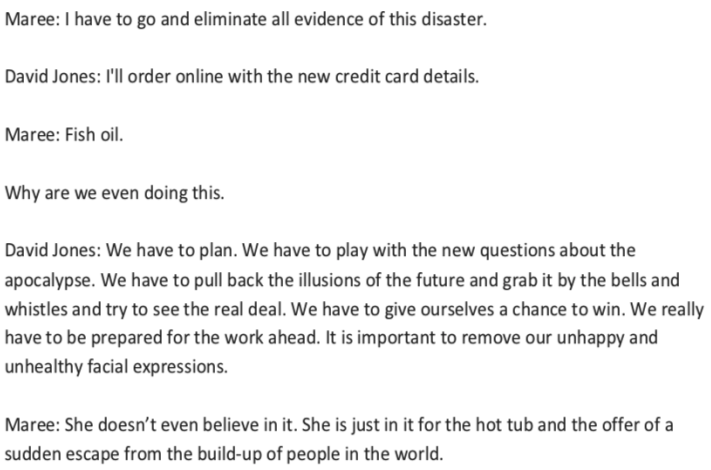
It was nine seventeen in the morning, and the house was heavy.	09:17:34
It was seven minutes to ten o'clock in the morning, and it was the only good thing that had happened.	09:53:46
What is it? the painter asked.	09:54:23
The time was six minutes until ten o'clock in the morning, and the wind stood as the windows were freshly covered with boxes.	09:54:43
The time was three minutes to ten o'clock in the morning, and the conversation was finished while the same interview was over.	09:57:17
It was three minutes to ten o'clock in the morning, and the sheets of coal had been broken.	09:57:35

Figure 3: A page from 1 the Road

B. The Lifestyle of the Richard and Family

The Lifestyle of the Richard and Family is a dramatic work intended for the stage. Creator, Roslyn Helper describes the play as "your classic dinner party setup that slowly deteriorates into a very abstract kind of farse."[136] The play involves five characters: Maree, David Jones, Jimmy, Sarah and Clare Martin. The dinner play starts out as a dinner party but descends into a "tech rave apocalypse."[137] The characters have clear personas (David Jones has a job and a gym membership and having an affair with Clare Martin, while Maree likes online shopping and has a drinking problem),[138] and the work primarily consists of dialogue between the characters. Figure 4 below shows an extract of the dialogue.

[135] *Id.* at 48.
[136] Interview with Roslyn Helper (Zoom interview July 30,m 2020) (transcript on file).
[137] *Id.*
[138] *Id.*



Maree: I have to go and eliminate all evidence of this disaster.

David Jones: I'll order online with the new credit card details.

Maree: Fish oil.

Why are we even doing this.

David Jones: We have to plan. We have to play with the new questions about the apocalypse. We have to pull back the illusions of the future and grab it by the bells and whistles and try to see the real deal. We have to give ourselves a chance to win. We really have to be prepared for the work ahead. It is important to remove our unhappy and unhealthy facial expressions.

Maree: She doesn't even believe in it. She is just in it for the hot tub and the offer of a sudden escape from the build-up of people in the world.

Figure 4: Section of The Lifestyle.

The work was created by Roslyn Helper "in collaboration with Swiftkey Note."[139] Swiftkey Note (now known as Swiftkey) is an application for Android and iOS cellphones owned by Microsoft.[140] The application consists of a keyboard which enables the user to type text (whether that is a text message, an email, or a document). As the user types, the application analyzes the language patterns of the user. After learning the language of the user, the keyboard makes predictions about word choice. When a user begins typing, the application will predict what word should come next. The application provides a choice of three words that may come next (see Figure 5). By selecting one of the words from the option, the user saves time that otherwise would be spent typing. What distinguishes Swiftkey from competitor applications (such as a standard iOS keyboard) is its use of neural networks.[141] The incorporation of machine learning allows the application to provide better predictive text.

[139] For credits for the work, see VIMEO, https://vimeo.com/263802155 (last visited Aug. 29, 2020).
[140] For an overview of the platform, see MICROSOFT SWIFTKEY, https://www.microsoft.com/en-us/swiftkey?rtc=1&activetab=pivot_1:primaryr2 (last visited Aug. 29, 2020).
[141] *Id*.

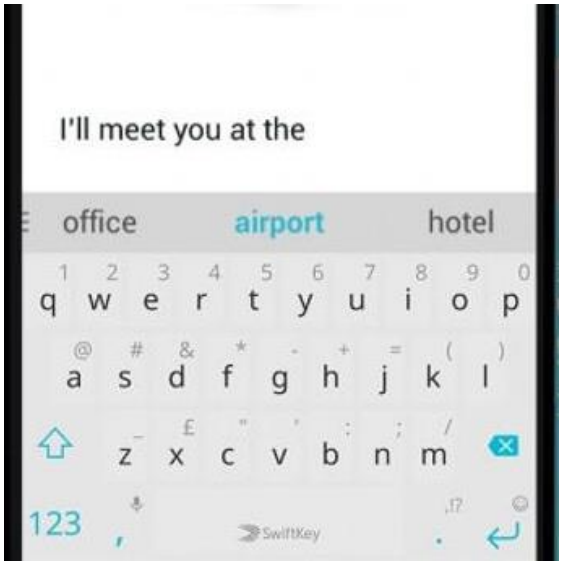


Figure 5: Swiftkey interface[142]

Roslyn Helper is a Melbourne based artist. She has a background in communications, government and international relations, rather than in technology.[143] Helper's art examines "modes of communication in a heavily mediated society" and "the way that we are making meaning through new platforms."[144] Previous works include the Human Google Project — a solo durational performance work here Helper attempts to take on the role of Google Search Engine.[145]

After downloading Swiftkey, Helper began "playing around" with the technology in what she describes an "exploratory phase."[146] During this phase, Helper used the application to send text messages to herself and to write poetry pieces. At a certain point in time, Helper began to turn her attention to writing a full-length work with Swiftkey. By this point, the application had begun to understand Helper's language patterns. Over the course of a "couple of months" Helper worked on the script.[147] This work was not "full time" but largely performed on days "here and there" when other commitments permitted.[148]

[142] For image content, see *Microsoft's SwiftKey Adds AI: Now It's Even Smarter at Knowing What You Want to Type*, ZDNET, https://www.zdnet.com/article/microsofts-swiftkey-adds-ai-now-its-even-smarter-at-knowing-what-you-want-to-type (last visited De. 25, 2020).
[143] Interview with Roslyn Helper, *supra* note 136.
[144] *Id.*
[145] *Id.*
[146] *Id.*
[147] *Id.*
[148] *Id.*

Helper began with the idea of a dinner party with five participants.[149] But other than that, Helper explains that she had no "macro" narrative in mind for the play.[150] She did not, for example, set out with the plan regarding how the script would start and end. Nor did she select the names of the characters or their character traits (the name David Jones is for example the name of a well-known retail chain in Australia and was suggested by the application).[151] These features emerged as Helper and the application created the dialogue. To create the dialogue, Helper would start with an idea for a sentence. For example, Helper may start out with the idea for a sentence such as "Hello, David." Helper would then type the first letter — "H" — and then the application would give her three options to choose from, for example "hope," "happy" and "hopefully." This list may or may not include the initial word that Helper had envisioned. Thereafter, Helper would select a word from the menu and move on to repeat the process with the next word. The word selection process was largely an organic and intuitive one. Rather than making thoughtful decisions regarding each word, Helper describes the process as "vibing it."[152] Lastly, one interesting part of the work was not written by Helper, but a friend, also using Swiftkey. As an experiment, Helper asked her friend to write some text for the play using Swiftkey trained on the friend's language patterns. Helper describes the friend's personality and character as "more out there" than herself, and that this translated into text which was more abstract and sexualized (with references to BDSM etc.).[153]

After the text was created, the work underwent a significant "editing" period.[154] Helper explains that the material which was created during the work's production was "far greater" than that which ended up in the final script.[155] The work underwent a process of "editing down" where Helper consciously considered "what made sense and what fits."[156] In particular this involved substituting sentences or chunks of text. This process was undertaken in order to create a "sense of narrative."[157] Helper explains that this narrative was, in this sense, "designed by me" but that it was a "retroactive" process.[158]

C. Edmond de Belamy

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[149] *Id.*
[150] *Id.*
[151] *Id.*
[152] *Id.*
[153] *Id.*
[154] *Id.*
[155] *Id.*
[156] *Id.*
[157] *Id.*
[158] *Id.*

Obvious Art is a collective of three French machine learning artists: Hugo Caselles-Dupre, Gauthier Vernier, and Pierre Fautrel.[159] Their goal is to "explore, use, and share the different ways machine learning algorithms can catalyze our natural creativity."[160] Each of the trio is involved in the production process and play a role in selecting works to produce. This study interviewed Pierre Fautrel only as Fautrel normally handles media inquiries into their works.

Obvious made headlines in 2018 when Christie's auctioned one of their A.I.s-created portraits, *Edmond de Belamy.*[161] The painting, shown in figure 6, is a portrait of a man printed on canvas. In the bottom right hand corner, the work is "signed" with a line of code ('$\min_G \max_D E_x$ [log ($D(x)$)] + E_z [log(1 – $D(G(z))$)]') — a reference to part of the algorithm that helped created the piece. Christie's publicized this as the first artwork created by artificial intelligence. The work sold for a substantial $432,500 (far above the pre-action estimates of $7,000 to $10,000).[162] This work forms part of a series of works called *La Famille de Belamy.*

Figure 6: Edmond de Belamy

[159] *About*, OBVIOUS ART, https://obvious-art.com/about-us.html (last visited Jan. 30, 2020).
[160] *Manifesto*, OBVIOUS: ARTIFICIAL: INTELLIGENCE FOR ART 3, https://drive.google.com/file/d/1esAOv8MsVzYH9njGmHnqUdgPh4aFDVvK/view (last visited Jan. 30, 2020).
[161] Cohn, *supra* note 6
[162] *Id*.

In order to create a work such as *Edmond*, Obvious begins by selecting a subject.[163] In the case of *La Famille de Belamy*, the subject was classical portraiture (more recent projects have included Japanese woodblock prints).[164] The trio explain their process of selecting a subject in the following way: "[w]e tend to focus on something that speaks to us, that is iconic in our society, and more importantly, that we like."[165]

Once a subject has been chosen, the collective starts collecting a database of pre-existing works of the subject.[166] This involves collecting tens of thousands of images.[167] Once the database is collected, it must be cleansed.[168] It is likely that some of the images in the initial database were "false positives" and included in the database by error. Perhaps a photograph has made its way into the database, or perhaps one image contains multiple people rather than just one.[169] These must be removed before the algorithm can be set to work training on the database. In order to make *Edmond de Belamy*, Obvious started with 20,000 portraits, and manually (i.e. sitting in front of the screen viewing each portrait individually) reduced that dataset to 14,000.[170] Later projects have involved even larger data gathering and cleaning efforts, such as the Japanese woodblock print series which started from 200,000 initial entries, paired down eventually to 30,000.[171]

Once the training process begins, Obvious must check the quality of the outputs produced by the algorithm.[172] This is largely a trial and error process, with the algorithm producing outputs and the operators checking whether the resulting outputs are "good" from an artistic point of view.[173] Pierre Fautrel analogizes the training process to a painter in front of a canvas: the collective check the outputs, and if they are not good enough, think about "what we could do differently," make necessary changes to the training data set, or to aspects of the algorithm's hyperparameters, i.e. the parameters used to control the learning process. Altering hyperparameters may include for example, changing the learning rate (the rate at

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[163] Interview with Pierre Fautrel, Obvious Art (Skype interview Sept. 13, 2019) (transcript on file).
[164] *Id.*
[165] OBVIOUS ART, *supra* note 160, at 8.
[166] *Id.* at 8.
[167] Interview with Pierre Fautrel, *supra* note 163.
[168] *Id.*
[169] *Id.*
[170] *Id.*
[171] *Id.*
[172] *Id.*
[173] OBVIOUS ART, *supra* note 159, at 9 ("We repeat this process until we get to the result we are all happy with, and the visual we are proud to display to the world.")

which the machine learns newly acquired information from data) or the batch size (the number of training examples the machine learning algorithm will provide). Obvious then runs the algorithm "again and again until it's good."[174] When the results are good enough, the training is complete, and the algorithm is used to produce hundreds of images. After which, Obvious select a number of works to form part of their series and decide how to present the work. For example, by selecting to frame the works, or even to add an algorithmic signature in the corner, as in the case of *Edmond de Belamy*. Fautrel estimates that the time taken from the "first discussion" of the project to the final creation is around six months.[175]

D. I AM AI

Taryn Southern is a singer-songwriter (with prior appearances on American Idol) but admits she does not have a "traditional musical background."[176] In 2017, singer Southern released, *I AM AI*.[177] The album received press attention for being the "world's first album composed and produced by an AI."[178] While the lyrics and vocal melodies on the album were produced by Southern alone, the instrumental musical composition was produced by Southern and Amper Music — a machine learning algorithm. The album's featured single, *Break Free*, can be listened to on YouTube.[179] In this case study, we are focusing on the instrumental musical compositions in *I AM AI* excluding the lyrics and vocal melodies (both separate works undeniably copyrightable by Southern).

Amper Score (the successor to Amper Music) is an algorithm that claims to enable individuals to create music in "just eight clicks."[180] The Amper Score application is pre-trained, thus enabling individuals without coding abilities to create tracks. After telling the algorithm how long the track needs to be, and the structure of the track (e.g. how long should the intro be, when should the outro begin, where is the climax of the track), the musician tells the algorithm what genre to compose in (pop? hip hop?), what sub-genre to use (dance? corporate?), what mood to compose in (care-fee? celebratory?), and what instruments to use

[174] *Id*.
[175] Fautrel Interview, *supra* note 163.
[176] *Id*.
[177] TARYN SOUTHERN, *I AM AI* (Independent 2018).
[178] Dom Galeon, *The World's First Album Composed and Produced by an AI Has Been Unveiled*, FUTURISM (Aug, 21 2017), https://futurism.com/the-worlds-first-album-composed-and-produced-by-an-ai-has-been-unveiled.
[179] Taryn Southern, *Break Free*, YOUTUBE (Aug. 21, 2017), https://www.youtube.com/watch?v=XUs6CznN8pw.
[180] Amper Music, *Introducing Amper Score*, YOUTUBE (Sept. 13, 2019), https://www.youtube.com/watch?v=M-5J5Nv0AC4.

(e.g. strings? percussion?).[181] Figure 7 below shows part of the decision tree through which Amper's users must navigate. After clicking "create," the machine will produce a first draft of the track. After which the operator can make various edits (such as changing the key, or individually editing the instruments used).

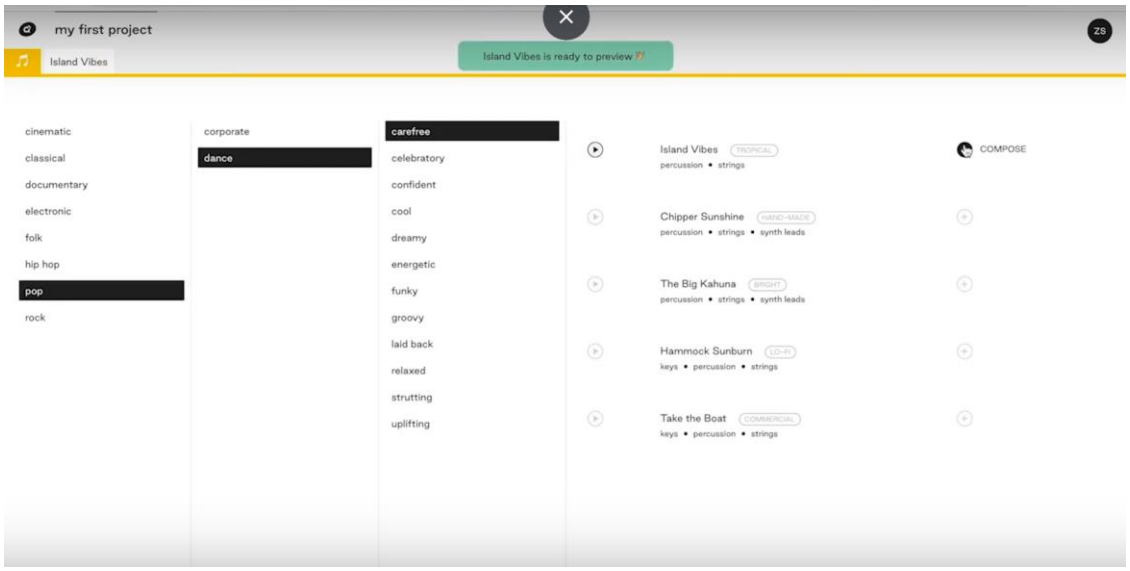

Figure 7: Amper Score

Southern describes the process of creating music through Amper as "similar to the process of working with another human being."[182] She started each track of *I AM AI* by making a series of decisions (e.g., BPM, rhythm, key etc.), then essentially giving the A.I. "feedback" on the possibilities it generated. The back and forth continued until Southern was "happy with the overall song."[183] This, Southern explains, was not what one might call a hard task, but was "time intensive."[184] It is "not like you just press a button and a beautiful song is created,"[185] Southern explains, because there is a certain amount of "decision making by the human"[186] (although the A.I. generates the initial possibilities from which the human makes choices). As a result, Southern calls the process somewhat "editorial" in nature.[187] The benefit of using Amper, from Southern's point of view, is that using A.I. allows her greater "control over the creative process."[188] When working with hired musicians, more of the decision making is outside Southern's control, whereas working with Amper allowed Southern to be involved in

[181] *Id.*
[182] Taryn Southern, Correspondence (Oct. 7, 2019) (on file with author).
[183] *Id.*
[184] *Id.*
[185] *Id.*
[186] *Id.*
[187] *Id.*
[188] *Id.*

the work's generation "from inception to completion."[189]

Southern initially became interested in the use of A.I. to overcome a "production challenge."[190] Southern, like many other artists, needed to find backing tracks but often found the process timely consuming and expensive. Amper was designed to overcome such challenges. Amper CEO, Drew Silverstein, has a background not in engineering, but in classical music. Silverstein worked as a composer of film music but quickly realized filmmakers were constrained in their ability to pay for such music. [191] After spotting this problem, Siliverstein created Amper to make the production of music quicker and easier for such users. While some artists, like Southern, use Amper to produce backing tracks for commercially available pop music, the applications extend further. Bloggers, documentary filmmakers, podcasters, game-makers, all can create their own tracks, quickly and efficiently, without needing to license pre-existing tracks. The "ability to create music on my own," Southern says, is "incredibly empowering"[192]. Had she had this option at age nineteen or twenty, she claims she would have pursued a career solely in music.[193]

IV. ANALYSIS

This Part analyzes the case studies. Section A provides a taxonomy of choices made by the creators in the case studies which may be understood as "creative." Those creative choices are referred to as "input choices," "training choices," and "output choices." Section B then turns to the question of whether the works would pass the originality threshold in the U.S., E.U., and U.K. The conclusion of Section B is that, if the works were to be litigated or challenged in court, there is a high probability that each would display sufficient creativity to pass the originality threshold and thus be eligible for copyright protection.

A. Taxonomy of Creative Choices

Many of the creators made creative "input choices." This term refers to choices regarding what data to feed into the machine learning algorithm to enable the work's creation. This may be further subdivided into "conceptual input" choices and "training data" choices. "Conceptual input" choices are choices about the nature of the work (i.e., the work's concept)

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[189] *Id.*
[190] *Id.*
[191] Mark Hogan, *Artificial Intelligence: Music's Next Frontier … The Drew Silverstein Interview*, HOT PRESS (Aug. 2019), https://www.hotpress.com/music/artificial-intelligence-musics-next-frontier-drew-silverstein-interview-22786307.
[192] *Id*.
[193] *Id*.

and the execution of that concept. For example, in *1 the Road*, Goodwin made a series of conceptual choices. Goodwin chose to pay homage to Kerouac's *On the Road* by creating a "car-written" novel documenting a trip from New York to New Orleans. Completing this conceptual vision required the machine learning algorithm to interact with its external environment. To that end, Goodwin chose to feed the machine with information from a GPS device, a surveillance camera, a clock, and a microphone. These choices were not utilitarian or functional, but were made because this information would facilitate the production of the ultimate artistic work. Of course, conceptual choices such as these raise the issue of copyright's idea-expression dichotomy.[194] Some of Goodwin's conceptual choices may be related to an unprotectable idea rather than a creative expression of that idea. Nevertheless, while the general idea of a "car-written novel" may be unprotectable, the precise manner of executing that idea — through the exact route devised by Goodwin and the types of sensors attached to the car — are likely to move into the territory of protectable expression. Further to these creative conceptual choices, Goodwin made a series of "training data choices." This term refers to the data upon which the machine learning algorithm must be trained. In Goodwin's case, he chose to train the algorithm on science fiction literature and "bleak" literature (as opposed to perhaps the more obvious choice of beatnik literature). Once again, these were aesthetically driven choices. Goodwin not only felt that beatnik literature would be "too on the nose," but also wanted the machine to have "the brain of a painter," and to that end, solicited recommendations regarding bleak literature from a painter that he admired.[195]

A second category of creative choice may be understood as creative "training choices." These are choices about the operation of the machine learning algorithm. This includes choices about the algorithm's hyperparameters such as learning rate (the rate at which the machine learns newly acquired information from data) and batch size (the number of training examples the machine learning algorithm will provide), as discussed by Obvious Art. This category of choices has a clear possibility to be utilitarian or functional, rather than creative. Nevertheless, two arguments suggest that some training choices can be considered creative. First, Pierre Fautrel analogizes the process of training an algorithm to the process a painter undergoes when standing in front of a canvas.[196] In both cases, the creator tries different techniques and approaches until the tools yield a result of sufficient aesthetic quality. Second, a significant amount of artistic endeavor involves choices about the mechanical operation of the tools or instruments which, nevertheless, would be routinely considered creative. For

[194] Baker v. Selden, 101 U.S. 99 (1879).
[195] Goodwin Interview, *supra* note 120.
[196] Fautrel Interview, *supra* note 163.

example, a guitarist may tune her guitar strings in different configurations to enable her to create a particular type of musical work (while "standard tuning" is the most common guitar tuning, "drop D tuning" is common in rock and metal, and "DADGAD tuning" is common in Celtic and folk music).[197] So long, therefore, as changing hyperparameters is performed in order to improve the aesthetic of the finished product, such choices could be considered "creative." On this point, however, it should be noted that this was the most under-explored topic in the interviews. As the conclusion points out, further research on the nature of these choices could be significant from a doctrinal perspective.

Lastly, the case studies also demonstrate a variety of creative "outcome choices." These are choices about the selection and presentation of outputs produced by the machine learning algorithm. The creators frequently made selection choices regarding what outputs of the machine learning algorithm to include in the final work. For example, Roslyn Helper explains that part of her editorial process involved sifting through the content produced and subtracting some elements of text in order to create a sense of narrative. Likewise, once the algorithm is trained, Obvious Art use the algorithm to produce multiple outputs, and then select some of those outputs to appear in the final series (just as *Edmond de Belamy* was an output in the *La Familie de Belamy* series). Similarly, aesthetic choices must be made about how to present the work, including potentially whether any modifications are required. For example, Obvious Art made a creative modification to *Edmond de Belamy* by adding the string of code to the work to indicate the nature of the work as created via machine learning. An interesting question, outside the scope of the current study, is to what extent creative outcome choices on their own will merit copyright protection. This is similar to the question of the copyrightability of *Objet Trouvés* (i.e. found objects).[198] The question, however, is not directly posed by the works studied here.

B. Copyrightability

Having categorized the types of creative choices made by the creators in the case studies, we turn to the copyrightability question. The question posed here is whether the precise choices made by the creators would be sufficient to pass the originality threshold in the U.S., E.U. and U.K.

1. *1 the Road*

In producing *1 the Road*, Goodwin made creative input choices. As highlighted earlier,

[197] *See generally* DICK WEISSMAN, GUITAR TUNINGS: A COMPREHENSIVE GUIDE (2006).
[198] *See generally* SIMON STOKES, ART AND COPYRIGHT 165 (2001).

those involved choices about the work's concept (a "car-written" novel), the execution of that concept (the sensors feeding information to the algorithm), and the data the algorithm was trained upon (science fiction and bleak literature). However, the work involved less substantial outcome choices. Once the algorithm produced the text, no further edits were made to that text. Similarly, it is not clear whether Goodwin made any explicitly creative training choices. Undoubtedly, Goodwin spent significant time and effort creating the algorithm and this involved testing the algorithm using validation data to ensure the quality of output. However, it did not clearly emerge from the interview that the operation of the algorithm was altered for purely aesthetic reasons. As noted above and below, this is an area for future research and investigation. While it is possible Goodwin made creative choices which simply did not emerge in the interview, we shall assume for the moment that no such choices were made.

Does the absence of creative training and output choices provide a bar to copyrightability in the case of *1 the Road*? In the author's view, this would likely not bar copyrightability in the jurisdictions studied. In all of the jurisdictions considered here, originality is binary matter: the work is either original or it is not.[199] If the putative author can prove that the work involved some aspect of the work involved a "modicum" of creativity under U.S. law, or was the "author's own intellectual creation" under E.U./U.K. law, then the work will be considered original, even if in other respects originality was not present. A non-A.I. example in this regard may come from photography. The individual who devises a concept for a photograph and selects appropriate scenery may be the copyright holder, even though she made no creative decisions about how the camera functioned and made no further selection or modification to the camera's outputs.[200] In this context, if Goodwin's input choices were sufficient to pass the originality threshold, then the work will be original even in the absence of any training or output choices.

The copyrightability of a literary work whose claim to originality is grounded solely in the presence of creative input choices would likely be a novel issue in U.S. law. Accordingly, there is no certainty regarding whether such works would be protected by a court or not. Nevertheless, there is at least a very strong argument that the work would receive protection and that Goodwin would be deemed the author of the resulting work. The standard of creativity is, according to the Supreme Court, "extremely low."[201] This is demonstrated in the area of

[199] Courts do not "dissect" a work into original and unoriginal elements at the copyrightability stage, but they do so at the infringement stage, see 2 PATRY, *supra* note 54, § 3:35.
[200] Burrow-Giles Lithographic Co., v. Sarony, 111 U.S. 53 (1884).
[201] Feist Publ'ns v. Rural Tel. Serv. Co., 499 U.S. 340, 343 (1991).

literary works by virtue of the fact that many works involving low originality are considered protectable. For example, computer programming code frequently meets the threshold of involving sufficient creativity to be a literary work.[202] Likewise, technical works, including manuals and reference works, which by consensus are deemed less creative, receive protection.[203] Furthermore, there is no requirement that literary prose be coherent in order to receive protection. Nonsense verse, such as the Lewis Carrol's *Jabberwocky* (and even more abstract examples), or scat lyrics in jazz (providing appropriately fixed), are copyrightable despite not making much "sense." The probability is high, therefore, that *1 the Road* would be considered original. The decision to create a car-written novel, that such work would pay homage to Kerouac's *On the Road*, that the source material for the work would come from science fiction and bleak literature, and that the algorithm would respond to various information sources (GPS unit, microphone, camera and clock), together display far more than a "modicum" of creativity, which in turn supports the conclusion that *1 the Road* is an original work of an author, i.e., Ross Goodwin.

We arguably come to the same conclusion when we consider E.U./U.K. law. In both jurisdictions, copyrightability requires the work to be "author's own intellectual creation" as evidenced by "free and creative choices" demonstrating a "personal touch."[204] As noted earlier, the C.J.E.U. has found that a string of 11 words could potentially pass this threshold.[205] Against this standard, it is likely that *1 the Road* is copyrightable on the basis of Goodwin's input choices. These choices were clearly free and creative in the sense of not flowing from utilitarian concerns. Furthermore, of all the works studied, this work arguably involves the clearest example of a "personal" touch. *1 the Road* displays a particularly strong connection to Goodwin's character and personality. The author-work relationship is reflected in a myriad of ways. The choice to re-create *On the Road* was an individual decision informed by Goodwin's own tastes in literature. Thereafter, the choice to train the work on bleak literature recommended by a painter whom Goodwin admired formed a personal link between Goodwin's personal history and the ultimate expression. Likewise, decisions that Goodwin made about the route, such as stopping at the reportedly haunted house, were made based on Goodwin's own ideas about what would create an interesting narrative, and subsequently these decisions found expression in the text. [206] Even the decision to train the work on science

[202] Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc., 797 F.2d 1222, 1224, n.1 (3d Cir. 1986).
[203] *See, e.g.*, Portionpac Chem. Corp. v. Sanitech Sys., Inc., 217 F. Supp. 2d 1238, 1246–47 (M.D. Fla. 2002).
[204] Case C-145/10, Eva-Maria Painer v. Standard Verlags GmbH, [2012] ECDR 6 (E.U.).
[205] Infopaq Int'l A/S v Danske Dagblades Forening, [2009] ECR I-6569 (E.U.).
[206] Goodwin Interview, *supra* note 120.

fiction and bleak literature, rather than the more obvious choice of training the algorithm on Kerouac or other Beatnik literature, was a rather idiosyncratic (perhaps even quirky) choice. Together, one may even go as far to call these decisions "hipster," in the sense that they are somewhat deliberately outside of the cultural mainstream and, at times, eschew the more obvious choices. It is somewhat surprising given the dominant scholarly views surrounding machine learning and copyright, but Goodwin's *1 the Road*, comes a lot closer to the ideal of "romantic authorship" (i.e. that of a lone genius creator[207]) than many contemporary copyrightable works.

Lastly, it is also clear that *1 the Road* involves clear "skill and labor." The evidence of skill and labor supports the conclusion that Goodwin is the author, to the extent that the skill and labor criteria is still relevant under U.K. law (or could potentially be in the future post the U.K.'s departure from the E.U.). The training process clearly involved both skill and labor, as did the process of driving the car along the 1000-mile journey. On the basis of Goodwin's skill and labor, and on the basis of the strong personal connection to the work, it is highly likely that *1 the Road* would not be considered a "computer-generated work" in the U.K. Instead, this would likely be considered an original work produced by Goodwin as the author. Of course, at this point, one might ask: Why does this matter? Hypothetically, if the work was deemed to be a "computer-generated work" then Goodwin, as the person who trained the machine learning algorithm and thereafter used the algorithm to produce the work, would undoubtedly be the person who made the necessary "arrangements" for the work's creation.[208] However, the finding that this work is not computer-generated, but instead created by Goodwin, is important for Goodwin on a personal level. If the work is human-authored rather than "computer-generated," then Goodwin would receive moral rights protections in the work, and not merely economic rights.

2. *The Lifestyle of the Richard and Family*

In producing *The Lifestyle of the Richard and Family*, Helper made both creative input and output choices, but arguably no creative training choices (as Swiftkey is a commercially available application. Helper had no opportunity to modify the algorithm or its hyperparameters). The input choices began with the decision to create a five character dinner party play. The input choices continued into the generation of dialogue. Helper formed an idea about how each sentence of dialogue would start and would trigger the dialogue-

[207] Martha Woodmansee, *The Genius and the Copyright: Economic and Legal Conditions of the Emergence of the 'Author'*, 17 EIGHTEENTH CENTURY STUDIES 425 (1984).
[208] Copyright, Designs and Patents Act 1988, s 9(3) (U.K.).

generation process by entering the first letter of the sentence into the Swiftkey application. Much like the conceptual choices made by Goodwin, there is a question mark about the application of the idea-expression dichotomy at this point. The decisions that Helper made were certainly creative choices, but were these choices related to an idea rather than to the expression of an idea? This is an area where courts enjoy significant discretion and it is accordingly a very difficult to predict how a court would answer the question. There is, nevertheless, an argument that, in starting each sentence of dialogue, Helper made creative choices about the expression of the idea (a dinner party play).

While the input choices made by Helper were important, they become more significant when coupled with the substantial output choices she made. Such output choices existed on two levels. First, when presented with a menu of words to insert into a sentence, Helper made a selection of one out of three. Helper did not consciously make these decisions based on an aesthetic judgement, but nor was the choice based on utilitarian or functional concerns. The selection was made intuitively based on what made sense to her in the moment. When this output choice is viewed in tandem with the choice regarding how to start each sentence, it is clear that Helper had not insubstantial control over the precise textual dialogue in the play. And secondly, once the raw text was generated, that text underwent a significant editorial stage in which Helper explicitly removed sentences or parts in order to better create a "sense of narrative."[209] This editorial process deepened the control that Helper had over the ultimate text.

The presence of creative input and output choices make a strong case that the work would pass the U.S. "modicum of creativity" standard and the E.U./U.K. "author's own intellectual creation" standard. The creative "spark" necessary to achieve copyright in the U.S. would arguably be satisfied by Helper's creative choices when viewed in isolation.[210] Arguably a sufficient spark of creativity was evident in merely starting each sentence of dialogue in a particular way or by selecting one word from a menu of three. When these choices are not viewed in isolation, but in combination, the argument for copyrightability strengthens. The combination of these choices, furthermore, helps deepen the "personal" connection between Helper and the ultimate work, as required by E.U./U.K. law. In this regard, the terminology Helper used to describe the process of word selection, i.e. "vibing it," is interesting.[211] The term "vibing" is strongly suggestive of the transmission of feeling or atmosphere (in the sense

[209] Helper Interview, *supra* note 136.
[210] Feist Publ'ns v. Rural Tel. Serv. Co,, 499 U.S. 340, 343 (1991).
[211] Helper Interview, *supra* note 136.

of the "vibe" in a room, or a person's good or bad "vibes"). In "vibing it," it is likely that Helper transmit some of her own characteristics into the text itself. This is particularly likely when one considers that the application had previously trained upon Helper's own language patterns. As an illustration of this latter point, consider the "abstract" section at the end of the play, which was created by a friend. Helper's friend with the more "out there" personality created a portion of the play, and this translated into text which was more sexualized. The contrast between this text, and the text created by the less "out there" personality of Helper, is sharp and highlights how much of Helper's text is connected to her own character. Of course, this also raises interesting questions about joint authorship which we shall not analyze in depth here. But there is sufficient evidence to make a prediction that the text written by Helper was her own original work and thus is the copyrightable work of Helper, the author.

As the author of the work, Helper would be entitled to economic and moral rights in the U.K. This conclusion is further strengthened by the fact that the work came together across a period of several months (developing from an exploratory phase into a more committed and time-consuming project) involving laborious effort. In a case like this, the finding that the work is human-generated rather than computer-generated is potentially significant. If the work was deemed computer-generated, and lacking a human author, then the copyright would be allocated to the person who made the "arrangements" for the work's creation. As Helper did not create the Swiftkey algorithm, the question on who made the necessary "arrangements" for the work is more complex than in, for example, *1 the Road*. However, the early indications are that, should this work be considered "computer-generated," then Helper would be considered the person who made the necessary arrangements. As highlighted above, L.J. Jacob in *Nova* tied the concept of "arrangements" to the concept of originality (by asking who contributed skill and labour of an artistic kind). In this case, it would seem very likely that Helper, rather than the Microsoft programmers, have contributed that necessary originality.[212]

3. *Edmond de Belamy*

In one respect, *Edmond de Belamy* involved the most creativity of all the of the works studied here. Unlike the other works, this work involved the full spectrum of creative choices, including creative input choices, training choices, and output choices. In creating the work, Obvious Art made both conceptual training choices and choices as to the training data. Obvious not only selected classical portraiture as the genre, but also the portraits that would make up their training set (including pairing down the initial data set of 20,000 portraits to 14,000). Creative training choices were made to the algorithm's hyperparameters to ensure

[212] *Supra* note 75.

the outcomes were "good" from an artistic point of view (the process which Fautrel analogizes to a painter before a canvas). Thereafter, from the outputs created, Obvious selected certain works to be part of the series and, in the case of *Edmond de Belamy*, modified it with the algorithmic signature.

As with the prior works, *Edmond de Belamy* would likely be an original work in the jurisdictions studied in this Article. As the preceding paragraph shows, the work involved a very full set of creative choices at all stages of the work's generation. The result is that Obvious Art had a very significant degree of control over the ultimate work. This would seem sufficient to pass the "modicum" of creativity necessary under U.S. law, where relatively modest photographs and drawings routinely receive copyright protection. These free and creative choices also help demonstrate the creators' personal touch, under E.U. / U.K. law. As highlighted earlier, Obvious selects a subject which "speaks" to them, suggesting a personal connection between the authors and the output.[213] Furthermore, Obvious describes their artistic goal as to "explore, use, and share the different ways machine learning algorithms can catalyze our natural creativity."[214] Arguably the choice of portraiture (a staple of natural human creativity) and the choices made in execution of that concept, furthered their self-selected mission and helped forge a personal connection to the work. Likewise, to the extent that skill and labor is still relevant under U.K. law, the creation process (approximately six months in duration) and manually cleaning the data set shows a significant amount of labor.

An interesting question, not fully explored in the interview, is how joint authorship principles may apply in a case like this. In the case of *Edmond de Belamy*, the most likely outcome is that the three members of Obvious Art were joint authors of the work. But, in order to be joint authors, each of the collective must contribute original expression to the work.[215] This would not be the case if, for example, one member of the group confined their role to purely technical endeavors (e.g., creating the machine learning algorithm and training it upon the data selected by others). In such a scenario, the technician in the group would not be an author, and not entitled to copyright (in the absence of a contractual agreement). In this current case, the three individuals each performed an artistic or aesthetic role in the construction of the work; each for example, contributed to the conceptual design of *Edmond de Belamy*, to selecting the training data, and to deciding what outputs were sufficiently "good."

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[213] *Supra* note 165.

[214] *Supra* note 160.

[215] Brown v. Flowers, 297 F. Supp. 2d 846, 852 (M.D.N.C. 2003), *aff'd*, 196 Fed.App'x 178 (4th Cir. 2006) ("[R]egardless of the test employed [for joint authorship], courts agree that a party must make some original contribution, on which is more than de minimis"); 2 PATRY *supra* note 54, § 5:14.

It is therefore likely that each of the trio would be considered an author contributing original expression to the work. Nevertheless, the scenario does point to an interesting question for the future: When will certain contributions to a group machine learning project be considered creative, and when will such contributions be viewed as merely technical?[216]

4. *I AM AI*

Lastly, *I AM AI* demonstrated creative input and creative output choices, much like *The Lifestyle of the Richard and Family*. The creative input choices were conceptual in nature and included telling the algorithm how long the track needs to be, the structure of the track, the genre and sub-genre, the mood and the instruments to use. Clearly Southern had an "idea" about how the track ought to sound, but the choices involved here (e.g. length, structure etc.) related to the expression of that idea rather than merely the idea itself. As a pre-trained software, Southern did not make any creative training data input choices nor creative training choices. But she did make creative output choices. When the algorithm produced output tracks, Southern edited those tracks, for example, by changing the key, or individually editing the instruments used.

Once again, these are likely to be free and creative choices, sufficient to pass either the "author's own intellectual creation" standard of the E.U., or the "modicum" of creativity standard of the U.S. What is particularly interesting about *I AM AI*, however, is the potential division between creativity and labor that it presents. On one hand, the work is highly creative. The advantage of using Amper was, according to Southern, the control this provided to her over the production process. If Southern worked with human musicians to create the track, she may lose a certain amount of control over the work. By using Amper, Southern retained almost complete control over the ultimate work and this afforded her the opportunity to make the type of free and creative choices which would demonstrate her personality. On the other hand, one could argue that using Amper reduced the amount of labor required to produce the compositions. The unique selling point of Amper (and similar applications) is that it enables individuals to create musical compositions, even if those individuals are not skilled instrumentalists, and in a fraction of the time that traditional musical composition requires. Of course, it is important not to overstate this point. Southern still describes the process of creating the works as "time intensive"[217] and even under the old U.K. "skill and labor" standard, the amount of labor required was minimal.[218] Nevertheless, *I AM AI* presents an interesting

[216] An interesting starting point to this discussion may be found in *Gaiman v McFarlane,* 360 F. 3d 644, 659 (7th Cir. 2004) (Judge Posner suggesting multiple individuals contributing non-copyrightable subject matter to a work copyrightable as a whole could be understood as co-authors).
[217] Southern, *supra* note 182.
[218] Walter v. Lane, [1900] AC 539 (U.K.), Ladbroke v. William Hill, [1964] 1 All ER 465 (U.K.).

example of a work, much like conceptual art, where creativity may be high, while labor may be low (relative to similar works in the same genre).

Of all the works studied, *I AM AI* presents the most interesting questions regarding the initial allocation of copyright ownership. As demonstrated, it is likely that Southern contributed originality to the work, and thus not only is the work copyrightable but Southern is an author of the work and entitled to the initial allocation of rights. However, is Southern the sole author of *I AM AI*? In this case, it would seem possible for the programmers to claim that they also contributed some originality to the resulting work (on the grounds that they built the library of tones and instruments in Amper and created an interface which constrained and channeled the creative choices of Southern). Under U.S. law, this raises the question that Ginsburg and Budiardjo perceive as the most appropriate and difficult question in the topic, i.e., how to allocate ownership of copyright when both programmers and users of algorithms contribute some creativity to the ultimate work?[219] This same question is relevant in both E.U. and U.K. law, and, should the work be considered "computer-generated" in the U.K., the question persists albeit in slightly different linguistic formulation (i.e., courts in this instance would likely ask who made the necessary "arrangements" for the work — Southern or Amper's programmers?).

We need not resolve this question fully here. The primary research question is whether the case studied works are eligible for copyright in the first instance, which *I AM AI* likely is on the grounds that Southern's contribution likely qualifies the album's instrumental compositions as "original works of authorship." But it is worth speculating on what may happen if Amper's programmers have also contributed some original expression to the work. One obvious option is that, in such a case, Southern and Amper's programmers are joint-authors of the work and thus joint owners.[220] However, this is not a forgone conclusion, as particularly U.S. law requires an intention to co-author.[221] It is not clear whether a court would find such an "intention" when the participants have had no direct interaction with one another. But nor can it be said that there are two separable copyright works that simply exist side by side, because the originality of the programmers and Southern is significantly interwoven into one final product.[222] It is likely therefore, that courts would need to develop new doctrine in such a case to appropriately allocate ownership. Ginsburg and Budiardjo propose a framework which courts could

[219] *Supra* note 97.
[220] 17 U.S.C. § 101 (joint authorship definition).
[221] *Id.*
[222] Ginsburg & Budiardjo, *supra* note 55, at 421.

potentially adopt in such cases.[223]

V. CONCLUSION

All of the works studied in this Article involved a series of creative choices. In each case, the ultimate work is heavily determined by the decisions of a human creator. Accordingly, they each stand a high chance of passing the originality threshold and receiving copyright protection in the U.S., E.U. and U.K. This conclusion is significant for the individuals in the study, who are likely to be able to claim copyright's economic and moral rights. But it also holds significance for legal scholars and courts. The case studies suggest that many works produced using the current set of machine learning tools will receive copyright protection. This in turn suggests that some literature may under estimate the amount of human creativity involved in producing works of machine learning, and over-estimate the incidence of purely machine created works. It also provides further support for a less dominant view in the literature (particularly the work of Grimmelmann, Ginsburg and Budiardjo) that there are not yet any truly computer-authored works. In particular, the studies here chime with Ginsburg and Budiardjo's observation that "the most technologically advanced machines of our era are little more than faithful agents of the humans who design or use them."[224]

This conclusion is made despite the limitations of the study. As demonstrated by the study itself, works produced via machine learning are highly heterogenous. There is a great diversity of works produced by machine learning. In this case, the author studied works produced by individuals who explicitly think of themselves as artists or creators. There are, naturally, a range of works which are produced by individuals who do not think of themselves as artists and do not consider themselves as engaging in an artistic process. Examples of works in this category may involve an individual who uses a translation software to translate a court decision or an individual who uses software to randomly generate a sequence of words. But the existence of A.I. works that do not involve creativity, do not detract from the central point highlighted by these case studies and this Article: that there is significant room for creativity within the field of machine learning works and that many such works will qualify for protection under traditional principles.

The conclusion that such works are largely copyrightable may change if courts modify the requirements for copyrightability. As noted earlier, there is currently no formal "causal"

[223] *Id*. at 431-39.
[224] Ginsburg & Budiardjo, *supra* note 55, at 343.

connection requirement between author and resulting work.[225] Likewise, the concept of "authorship" does not have a particularly robust standalone definition, but is often a label attached to the person who supplies the necessary originality.[226] Some scholars have attempted to deduce principles of causality and authorship, and made interesting arguments about how such concepts could fit within formal legal doctrine;[227] but so far courts have not clearly endorsed those views. However, if courts were to adopt these scholarly theories, and articulate more substantive concepts of authorship and causality, then more questions could be raised about the copyrightability of the case studies. In particular, the unpredictable nature of the algorithms' outputs may result in claims that the relevant creators were not the relevant "cause" or the "author" of the works. This line of questioning becomes even more pressing if we consider the idea-expression dichotomy. Even if we assume the creators supply originality, in the sense of free and creative choices, there is the possibility (on display to a degree in the case studies[228]) that such choices relate to the idea behind the work, rather than the expression of the idea; one may argue that the precise expression of the idea is more attributable to the unpredictability of the algorithm. Nonetheless, my prediction is that, should courts develop the causation or authorship concepts further, the creators of the works studied here would still qualify as authors of the works. This conclusion flows from the fact that the creators enjoy a high level of control over the aesthetic nature of expression in the resulting works. But of course, such a conclusion would depend on the precise nature of the causation or authorship concepts that courts endorse.

The conclusions of this study call into question the need for bespoke legal regimes to ensure the protection of machine learning works, such as that found in the U.K. The works studied here are likely to be suitable candidates for copyright on normative grounds. Copyright is a tool for incentivizing a certain type of public goods (i.e., creative works),[229] and also provides protection for natural rights in works of authorship.[230] While this Article has not focused on copyright theory, it seems likely that the works studied in the case studies are works which should be incentivized as a matter of policy, and where the creators may have legitimate natural rights claims. The finding that these works are likely to receive copyright protection under traditional copyright principles is accordingly interesting. This finding

[225] *Supra* notes 82-84 and accompanying text.
[226] *Supra* notes 53-56 and accompanying text.
[227] *Supra* notes 53.
[228] *Supra* note 194 and accompanying text.
[229] *See, e.g.*, William Landes & Richard Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325 (1989).
[230] *See, e.g.*, Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287 (1988).

suggests that those works which *deserve* copyright protection, are likely to receive it under the existing law. The danger presented by the U.K.'s specific legal regime is that, rather than shore up the copyrightability of works that deserve protection, it merely extends protection to a class of works which do not deserve protection. If the provision extends protection to works which would not pass the traditional originality threshold, it potentially extends protection to works which ought to be in the public domain.

The study here also demonstrates the need for further empirical research into machine learning and creativity. In particular, further research of an empirical nature, ought to be conducted into the specific sub-categories of creative work. This Article has begun the empirical analysis by studying one literary work, one dramatic work, one artistic work, and one musical work. Future studies could focus on any one of these categories alone. This would be particularly beneficial to demonstrate the full range of creativity that is involved in machine learning works. By focusing on literary works, for example, researchers could document and analyze works which fall on both ends of a spectrum, from the highly creative (such as *1 the Road*) to the minimally creative (such as the translated text example). Similarly, further empirical work ought to be undertaken to consider the impact of training choices on the ultimate work. To what extent is changing an algorithm's hyperparameters an artistic endeavor undertaken to produce an aesthetic result is a question requiring further data gathering.

The theoretical questions posed by this study are also very significant. We have so far bracketed questions about derivative works and potential copyright infringement. This study operated on the basis that the works studied were not derivative of their underlying source material. That assumption could be questioned. To what extent does creating a work via an algorithm, which has been trained on earlier works, create an infringing derivative work? Or to what extent does the idea/expression dichotomy, the substantial similarity doctrine, or fair use, apply to ensure that such resulting works are non-infringing?

Similarly, more research will be required on the policy implications of machine learning and creativity. This Article has focused on a group of works for which copyright would, arguably, be normatively justifiable (to the extent that copyright is ever normatively desirable). An interesting example in this regard is the new GPT-2 algorithm.[231] GPT-2 is an algorithm

[231] Alec Radford et al, Learning Models are Unsupervised Multitask Learnings (2019), https://cdn.openai.com/better-language-models/language_models_are_unsupervised_multitask_learners.pdf.

by Open-AI which allows large scale text generation.[232] The algorithm has both a pre-trained version and a version that can be trained by oneself. Intriguingly, Goodwin states that if he were to create *1 the Road* again, he would do so with the GPT-2 algorithm rather than his own created software, because of its superior text-creation process.[233] Open-AI have been cautious in their release of the algorithm to the public. Their stated concern is that individuals could use the software to create large amounts of "fake news" text.[234] However, such algorithms also pose intriguing questions for copyright policy. If large amounts of text can be generated very quickly, should those resulting works be eligible for copyright? There would seem to be no market failure relating to such works, and presumably the answer is that providing copyright in such cases does not further the stated policy goals of copyright law. More thorough analysis of the policy implications of copyrightability of such works would be required to come to a definitive conclusion.

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[232] *Id.*
[233] *Id.*
[234] Adam Geitgey, *Faking the News with Natural Language Processing and GPT-2*, MEDIUM (Sept. 27, 2019), https://medium.com/@ageitgey/deepfaking-the-news-with-nlp-and-transformer-models-5e057ebd697d.

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