
From: alex mitchell <alex@boomy.com>
Sent: Friday, January 10, 2020 1:23 AM
To: aipartnership
Subject: Response to Request for Comments on Intellectual Property Protection for Artificial Intelligence Innovation
Attachments: Alex Jae Mitchell - Request for Comments on Intellectual Property Protection for Artificial Intelligence Innovation.pdf

Thank you for the opportunity to comment on these important issues. I have included comments below as email text, and have also attached these comments in PDF format.

Mr. Iancu and colleagues,

Algorithms are the past, present, and future of music.

As the founder of Boomy Corporation, a music artificial intelligence firm, I am frequently asked questions very similar to those outlined here. Discussions of authorship and creative effort are foundational to our business, the people who use our products, and perhaps most pertinently to the talent – both musical and technical, composers and machine learning PhDs alike – with whom we work to create original music generation technologies.

People use our products to create original music near-instantly, and often without any prior musical knowledge, for free. Our music generation processes are semi-automated and leverage artificial intelligence technologies; at the direction of a person, our technology composes (writes notes) and produces (creates sounds) full-length recorded musical works in seconds. This enables people to participate in the music creation process – and recorded music economy – regardless of their access to music education, social status, or economic background.

Our company is unique in many ways, including in that we are backed both by Silicon Valley venture capital as well as traditional music companies. Our investors may have differing views on the issues I am outlining below.

My answers will focus primarily on applications of AI to original music composition and production. While the questions posed here apply more broadly than just music, any usefulness in my contribution would derive from insight gleaned following an exploration of this area with our music copyright attorney and from our actively growing market. I would be happy to clarify any of this or supply additional information, to the extent it may be useful as the USPTO considers its guidance. I have declined to answer questions beyond number 5, as I am not an attorney and my knowledge areas are not relevant to those questions.

Alex Jae Mitchell
Chief Executive Officer, Boomy Corporation

1. Should a work produced by an AI algorithm or process, without the involvement of a natural person contributing expression to the resulting work, qualify as a work of authorship protectable under U.S. copyright law? Why or why not?

There is currently no way for an AI algorithm or process to exist without the involvement of a natural person, and it is hard to imagine a line beyond or before which that involvement is not an act of creative expression.

Until computational processes can achieve measurable sentience, every algorithm, no matter how complex, has a natural person or set of persons at its root. These persons are contributing expression because the critical design and implementation decisions in designing algorithms and AI processes are indisputably creative.

In any case of a creative work produced or assisted by algorithms, expression is necessarily contributed by the designers and creators of those algorithms. While the specifics of algorithms and their implementations vary, there is a constant: a person, or group of people, designing the algorithm for a purpose. The extent to which those algorithms can be optimized by various methods of automation— which is what people usually mean when they say “AI” – is largely irrelevant to the question of authorship in my view, as the knowledge and application of those methods is itself the creative act of expression.

To be certain, algorithms can and do produce creative works so efficiently that the process seems effortless. But the seeming ease with which an algorithm produces an original work tends to mask the herculean effort (and expense) put into that algorithm’s design and implementation by its creators. With this in mind, each original work produced by an algorithm is clearly the creative work of the designer or designers of the individual algorithms and should qualify as a work of authorship protectable under U.S. copyright law as a result.

This is obvious to many in the music market, where there are decades of precedent of musicians designing fully-automated or semi-automated systems to produce creative works (including the majority of work by ambient artists like Brian Eno), and then claiming and receiving copyright to those works – there are entire genres that have been enabled from these practices and the markets they created. Current music automation methodologies are not substantially different in their inspiration or application than these historical methods of music automation. To claim that some type of automation in a creative process, AI or otherwise, would disqualify the resulting work from copyright protection, would be a dramatic shift from the creative freedom currently enjoyed across generations of musicians.

2. Assuming involvement by a natural person is or should be required, what kind of involvement would or should be sufficient so that the work qualifies for copyright protection? For example, should it be sufficient if a person (i) designed the AI algorithm or process that created the work; (ii) contributed to the design of the algorithm or process; (iii) chose data used by the algorithm for training or otherwise; (iv) caused the AI algorithm or process to be used to yield the work; or (v) engaged in some specific combination of the foregoing activities? Are there other contributions a person could make in a potentially copyrightable AI-generated work in order to be considered an “author”?

Each of the examples provided here would clearly be sufficient to assign authorship, but the specifics of the methodologies and commercial arrangements used is crucial in each case. To help understand this, below I’ve outlined two examples in practice. Through these examples, I also aim to illustrate why introducing the theoretical concept of an “AI-generated work” without a sufficient definition of what “AI” means could easily encompass both modern and historical creatives process in music, however automated.

Here’s an example of a music generation algorithm. A person selects a single note from a possible range of notes, such as E2-B4, to feed the algorithm. The algorithm uses a mathematical equation to determine a creatively pleasing repetition of that note. At the direction of the algorithm and without specific direction from the person, the pitch of some of those repeated notes are changed. The result is an output of many notes in sequence, most of which deviate from the original notes, creating a unique new composition outside of the single note provided by the user.

The algorithm I have described above is a delay pedal, and the note selection is a standard guitar. A “pedal” or “effect” is a type of physical or digital device which an instrument is meant to attach to, that changes the sound of the instrument in some way. Many of these effects change not only the sound of an instrument, but the pitch,

which in turn materially impacts the underlying composition of a musical work. Each effect *is* an algorithm: a signal comes in, is impacted by a mathematical process, and a different signal goes out. Some common effects contain algorithms so complex, that the output is indistinguishable from the input.

In the vast majority of cases of individuals using electric guitars for the past several decades, various effects are combined with specialized equipment in order to create unique sounds. Certain artists have gained notoriety and respect from the music community at large specifically due to their creative use of effects; for example, Kevin Shields of My Bloody Valentine is well known for his complex combinations of dozens of effects to create unique sounds with guitar (the “shoegaze” genre is defined by this practice, named after artists looking down at their shoes at their pedals). Put another way: artists have leveraged algorithms creatively for decades, and in a number of cases, the notoriety of an artist specifically resulted from their creative use of algorithms. Whether or not an artist is aware of the mathematical details of the algorithms he or she is combining is irrelevant to the copyrightability of the resulting musical output.

What is AI? The popular and scientific definitions are loose and have evolved quickly. It is mostly a colloquial stand-in for “algorithms” and “automation,” or perhaps more specifically “algorithms created with machine learning,” however, there is no static definition of “machine learning” either. It is far from a stretch to say that a guitarist who plucks one note through a dozen pedals is creating an algorithmically generated, or “AI-generated,” musical work.

A statutory definition of “artificial intelligence” provided by Section 238(g) of H.R.5515 is broad enough to cover this and other common historical music creation processes. This definition includes (1) “Any artificial system that performs tasks under varying and unpredictable circumstances without significant human oversight” and (2) “An artificial system developed in computer software, physical hardware, or other context that solves tasks requiring human-like perception, cognition, planning, learning, communication, or physical action.”^[1] A guitarist linking together many pedals containing signal manipulation algorithms is using “physical hardware” to “solve tasks requiring human-like perception [...] or physical action” using “an artificial system.”

Let’s consider this simple example in the context of the sufficiency question. Specifically, a case in which an “AI-generated” work is made by a guitarist who plucks a single note, causing that note to play through a delay pedal and one or more additional pedals, which results in a unique composition of many notes substantially defined by the algorithms contained in the pedals.

“Should it be sufficient if a person...”

(i) designed the AI algorithm or process that created the work;

In this case, the guitarist has created the work by first designing the algorithm (deciding which pedals to use) and then causing the work to be created (plucking the note), and authorship would be assigned to the guitarist, and copyrightability of the resulting work would be hard to question in this case.

It might seem odd to assign authorship to the creator of the pedals. However, a contract could cover a scenario in which the guitarist agrees to assign ownership (and associated authorship/copyright) of their work to the creator of the pedals, perhaps in exchange for free access to those pedals. One could imagine a studio in which use of equipment (including the delay pedal) was free, but the ownership and copyright of songs produced by that equipment was contractually assigned to the owners of the studio. Or more realistically, a contract in which access to the studio (including the delay pedal) is paid for by some company, and ownership (and associated authorship/copyright) of the resulting work was assigned to the company paying for the studio access. Current contract law clearly covers that scenario as such contracts are foundational to the current operations of music labels and publishers.

(ii) contributed to the design of the algorithm or process;

The guitarist contributed design of the algorithm and process (delay + other pedals + single note). Simply selecting the order of pedals, and note provided, is a method of algorithm design. Again, this guitarist could contractually assign ownership to the delay pedal creator or some other entity if he or she chose to.

(iii) chose data used by the algorithm for training or otherwise;

The guitarist chose the “data” – which string to pluck, and the algorithm, and process (delay + other pedals + single note), and could contractually assign ownership to the delay pedal creator or some other entity if he or she chose to.

(iv) caused the AI algorithm or process to be used to yield the work; or

The guitarist plucked a string, which caused the process to yield the work, and could contractually assign ownership to the delay pedal creator or some other entity if he or she chose to.

(v) engaged in some specific combination of the foregoing activities?

It is pretty clear that in this scenario, each of the activities alone is sufficient for copyrightability and any combination would be beyond sufficient.

I am using the example of a guitar and a pedal since this common practice pre-dates not only the popularized modern definitions of AI, but also personal computers and the resulting proliferation of music produced by personal computers. For decades, electric guitars and delay pedals were designed using analog circuits and became more advanced as digital infrastructure became more accessible. If algorithmic processes like these have been common (and in some cases essential) in music creation pre-computer, pre-internet, pre-machine learning, how are modern applications sufficiently different?

To explore this, let’s consider a more complex music generation algorithm example, more in line with modern and forward-looking technologies. A person (“creator”) selects a genre to feed the algorithm, for example “Hip Hop.” The algorithm – which has been designed by individuals (“algorithm designers”) to mimic common sounds and compositional aspects of various genres, where part of that design involved training an algorithm to identify commonalities among historical Hip Hop works – creates an original musical work at the direction of this creator, in the style of the Hip Hop genre.

“Should it be sufficient if a person...”

(i) designed the AI algorithm or process that created the work;

In our previous example, the guitarist has achieved sufficient authorship due to their effort in designing the underlying algorithm (putting pedals together). This modern example is no different. The algorithm creators made creative and intentional decisions, which resulted in a work, so by default the algorithm creators should receive authorship credit.

In practice, this modern example would rarely occur without a contractual relationship between the creator and algorithm designers. An algorithm designer could choose to release their algorithm for free, or in exchange for ownership of the works, or in exchange for money. It is my view that current contract law is sufficient to cover the vast majority of practical uses.

Either way, the effort of the algorithm designers is sufficient for copyrightability of the work.

(ii) contributed to the design of the algorithm or process;

Even with the simple input of “Hip Hop,” the creator in our scenario has contributed to the process. This is why contractual relationships are so important in practice; one could imagine a dispute arising from between the creator and algorithm designers where the creator feels entitled to the authorship.

But on the question of sufficiency, while this would be dependent on the relationship between the creator and algorithm designers, the contribution of the creator is sufficient for copyrightability of the work.

(iii) chose data used by the algorithm for training or otherwise;

As outlined earlier, even when autonomous or semi-autonomous processes are utilized to create an algorithm, that algorithm is still being directed, tweaked, and otherwise improved by a natural person and the choices made by the natural person have a material impact on the output of that algorithm.

In our modern example, the effort of the algorithm designers – which includes data chosen for training – is sufficient for copyrightability of the work.

(iv) caused the AI algorithm or process to be used to yield the work; or

It is difficult to imagine a practical case in which a person causing an algorithm to yield a work is not also contributing to that algorithm or process in some way. In our modern example, the user selecting “Hip Hop” as a genre is contributing to the algorithm as well as causing the example to be used in the work, so this could be sufficient for copyrightability of the work.

If a person caused an algorithm to yield a work without any input whatsoever, or that algorithm was triggered through non-action from a person or unintentionally by a person, that could call into question that person’s right to an authorship claim. The specifics matter.

(v) engaged in some specific combination of the foregoing activities?

It is pretty clear that in this scenario, each of the activities alone is sufficient for copyrightability and any combination would be beyond sufficient.

I feel it is necessary to frame the question not in terms of why *would* a musical work made with algorithms be copyrightable, but why *wouldn't* it, as algorithms have been used to make music for essentially the entire history of the recorded music business. To create a rule that says a particular level of automation would exclude a work from copyrightability is a dangerous line to walk, beyond which there are few outcomes that do not result in an explicit limitation of creative freedom. Such a rule would need to be so esoterically specific to a particular methodology that it would be nearly impossible to enforce, and would risk dampening creative expression generally. It is difficult to imagine the benefits.

3. To the extent an AI algorithm or process learns its function(s) by ingesting large volumes of copyrighted material, does the existing statutory language (e.g., the fair use doctrine) and related case law adequately address the legality of making such use? Should authors be recognized for this type of use of their works? If so, how?

It is my view that existing statutory language and related case law do adequately address the legality of making use of copyrighted material for algorithms.

Notably, ingesting large volumes of copyrighted material is just one method of creating an algorithm. Often, the resulting models are combined with other algorithms and processes to create a work. This presents a wrinkle in the potential assignment of recognition to the authors of training data – at what specific point in some algorithm did that authors’ work influence the outcome? It is impossible to know, and finding out would necessarily involve a full disclosure of the algorithm, presenting potential conflicts around trade secrets and confidentiality. This is further complicated by the fact that there are many algorithms (“models”) which are open source and provided freely by researchers, which may have been trained on copyrighted material, with end users having no way of knowing what went into the training of those algorithms; those algorithms can be further trained on copyrighted or non-copyrighted material, and so forth.

It is understandable to want to assign some recognition to the authors of underlying data that trained an algorithm, however, the *data itself* is not included in the algorithm’s output, but rather the *patterns gleaned from the data*. This is a crucial difference.

4. Are current laws for assigning liability for copyright infringement adequate to address a situation in which an AI process creates a work that infringes a copyrighted work?

Yes.

5. Should an entity or entities other than a natural person, or company to which a natural person assigns a copyrighted work, be able to own the copyright on the AI work? For example: Should a company who trains the artificial intelligence process that creates the work be able to be an owner?

Yes, a company that trains an artificial intelligence process should be able to be an owner of resulting works. The current ability for a company to own copyright on a work created with its technology is important to continued innovation in the AI sector. Many major contributions to AI are being made by private companies, and continued investment is dependent on potential for AI commercialization.

This commercialization is still in its infancy and should be encouraged. Owning copyright of assigned generated works should continue to be a viable commercialization option for companies investing in AI technologies. Today, in most practical cases where a natural person assigns a copyrighted “AI-generated” work to a company, that company is also the company that trained the artificial intelligence process that created the work. These relationships are governed by contracts, and it’s working.

¹ National Defense Authorization Act of 2019, Pub. L. No. 115-232, § 238(g), 132 Stat. 1638 (2019).

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The United States Patent and Trademark Office (“USPTO”) is gathering information about the impact of artificial intelligence (“AI”) technologies on intellectual property law and policy. To assist in gathering this information, on August 27, 2019, the USPTO published questions related to the impact of artificial intelligence inventions on patent law and policy and asked the public for written comments. Those questions cover a variety of topics, including whether revisions to intellectual property protection are needed. The present notice extends this inquiry to copyright, trademark, and other intellectual property rights impacted by AI.

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As the founder of Boomy Corporation, a music artificial intelligence firm, I am frequently asked questions very similar to those outlined here. Discussions of authorship and creative effort are foundational to our business, the people who use our products, and perhaps most pertinently to the talent – both musical and technical, composers and machine learning PhDs alike – with whom we work to create original music generation technologies.

People use our products to create original music near-instantly, and often without any prior musical knowledge, for free. Our music generation processes are semi-automated and leverage artificial intelligence technologies; at the direction of a person, our technology composes (writes notes) and produces (creates sounds) full-length recorded musical works in seconds. This enables people to participate in the music creation process – and recorded music economy – regardless of their access to music education, social status, or economic background.

Our company is unique in many ways, including in that we are backed both by Silicon Valley venture capital as well as traditional music companies. Our investors may have differing views on the issues I am outlining below.

My answers will focus primarily on applications of AI to original music composition and production. While the questions posed here apply more broadly than just music, any usefulness in my contribution would derive from insight gleaned following an exploration of this area with our music copyright attorney and from our actively growing market. I would be happy to clarify any of this or supply additional information, to the extent it may be useful as the USPTO considers its guidance. I have declined to answer questions beyond number 5, as I am not an attorney and my knowledge areas are not relevant to those questions.

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1. Should a work produced by an AI algorithm or process, without the involvement of a natural person contributing expression to the resulting work, qualify as a work of authorship protectable under U.S. copyright law? Why or why not?

There is currently no way for an AI algorithm or process to exist without the involvement of a natural person, and it is hard to imagine a line beyond or before which that involvement is not an act of creative expression. Until computational processes can achieve measurable sentience, every algorithm, no matter how complex, has a natural person or set of persons at its root. These persons are contributing expression because the critical design and implementation decisions in designing algorithms and AI processes are indisputably creative.

In any case of a creative work produced or assisted by algorithms, expression is necessarily contributed by the designers and creators of those algorithms. While the specifics of algorithms and their implementations vary, there is a constant: a person, or group of people, designing the algorithm for a purpose. The extent to which those algorithms can be optimized by various methods of automation— which is what people usually mean when they say “AI” — is largely irrelevant to the question of authorship in my view, as the knowledge and application of those methods is itself the creative act of expression.

To be certain, algorithms can and do produce creative works so efficiently that the process seems effortless. But the seeming ease with which an algorithm produces an original work tends to mask the herculean effort (and expense) put into that algorithm’s design and implementation by its creators. With this in mind, each original work produced by an algorithm is clearly the creative work of the designer or designers of the individual algorithms and should qualify as a work of authorship protectable under U.S. copyright law as a result.

This is obvious to many in the music market, where there are decades of precedent of musicians designing fully-automated or semi-automated systems to produce creative works (including the majority of work by ambient artists like Brian Eno), and then claiming and receiving copyright to those works — there are entire genres that have been enabled from these practices and the markets they created. Current music automation methodologies are not substantially different in their inspiration or application than these historical methods of music automation. To claim that some type of automation in a creative process, AI or otherwise, would disqualify the resulting work from copyright protection, would be a dramatic shift from the creative freedom currently enjoyed across generations of musicians.

2. Assuming involvement by a natural person is or should be required, what kind of involvement would or should be sufficient so that the work qualifies for copyright protection? For example, should it be sufficient if a person (i) designed the AI algorithm or process that created the work; (ii) contributed to the design of the algorithm or process; (iii) chose data used by the algorithm for training or otherwise; (iv) caused the AI algorithm or process to be used to yield the work; or (v) engaged in some specific combination of the foregoing activities? Are there other contributions a person could make in a potentially copyrightable AI-generated work in order to be considered an “author”?

Each of the examples provided here would clearly be sufficient to assign authorship, but the specifics of the methodologies and commercial arrangements used is crucial in each case. To help understand this, below I’ve outlined two examples in practice. Through these examples, I also aim to illustrate why introducing the theoretical concept of an “AI-generated work” without

a sufficient definition of what “AI” means could easily encompass both modern and historical creatives process in music, however automated.

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The algorithm I have described above is a delay pedal, and the note selection is a standard guitar. A “pedal” or “effect” is a type of physical or digital device which an instrument is meant to attach to, that changes the sound of the instrument in some way. Many of these effects change not only the sound of an instrument, but the pitch, which in turn materially impacts the underlying composition of a musical work. Each effect *is* an algorithm: a signal comes in, is impacted by a mathematical process, and a different signal goes out. Some common effects contain algorithms so complex, that the output is indistinguishable from the input.

In the vast majority of cases of individuals using electric guitars for the past several decades, various effects are combined with specialized equipment in order to create unique sounds. Certain artists have gained notoriety and respect from the music community at large specifically due to their creative use of effects; for example, Kevin Shields of My Bloody Valentine is well known for his complex combinations of dozens of effects to create unique sounds with guitar (the “shoegaze” genre is defined by this practice, named after artists looking down at their shoes at their pedals). Put another way: artists have leveraged algorithms creatively for decades, and in a number of cases, the notoriety of an artist specifically resulted from their creative use of algorithms. Whether or not an artist is aware of the mathematical details of the algorithms he or she is combining is irrelevant to the copyrightability of the resulting musical output.

What is AI? The popular and scientific definitions are loose and have evolved quickly. It is mostly a colloquial stand-in for “algorithms” and “automation,” or perhaps more specifically “algorithms created with machine learning,” however, there is no static definition of “machine learning” either. It is far from a stretch to say that a guitarist who plucks one note through a dozen pedals is creating an algorithmically generated, or “AI-generated,” musical work.

A statutory definition of “artificial intelligence” provided by Section 238(g) of H.R.5515 is broad enough to cover this and other common historical music creation processes. This definition includes (1) “Any artificial system that performs tasks under varying and unpredictable circumstances without significant human oversight” and (2) “An artificial system developed in computer software, physical hardware, or other context that solves tasks requiring human-like perception, cognition, planning, learning, communication, or physical action.”¹ A guitarist linking together many pedals containing signal manipulation algorithms is using “physical

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hardware” to “solve tasks requiring human-like perception [...] or physical action” using “an artificial system.”

Let’s consider this simple example in the context of the sufficiency question. Specifically, a case in which an “AI-generated” work is made by a guitarist who plucks a single note, causing that note to play through a delay pedal and one or more additional pedals, which results in a unique composition of many notes substantially defined by the algorithms contained in the pedals.

“Should it be sufficient if a person...”

(i) designed the AI algorithm or process that created the work;

In this case, the guitarist has created the work by first designing the algorithm (deciding which pedals to use) and then causing the work to be created (plucking the note), and authorship would be assigned to the guitarist, and copyrightability of the resulting work would be hard to question in this case.

It might seem odd to assign authorship to the creator of the pedals. However, a contract could cover a scenario in which the guitarist agrees to assign ownership (and associated authorship/copyright) of their work to the creator of the pedals, perhaps in exchange for free access to those pedals. One could imagine a studio in which use of equipment (including the delay pedal) was free, but the ownership and copyright of songs produced by that equipment was contractually assigned to the owners of the studio. Or more realistically, a contract in which access to the studio (including the delay pedal) is paid for by some company, and ownership (and associated authorship/copyright) of the resulting work was assigned to the company paying for the studio access. Current contract law clearly covers that scenario as such contracts are foundational to the current operations of music labels and publishers.

(ii) contributed to the design of the algorithm or process;

The guitarist contributed design of the algorithm and process (delay + other pedals + single note). Simply selecting the order of pedals, and note provided, is a method of algorithm design. Again, this guitarist could contractually assign ownership to the delay pedal creator or some other entity if he or she chose to.

(iii) chose data used by the algorithm for training or otherwise;

The guitarist chose the “data” – which string to pluck, and the algorithm, and process (delay + other pedals + single note), and could contractually assign ownership to the delay pedal creator or some other entity if he or she chose to.

(iv) caused the AI algorithm or process to be used to yield the work; or

The guitarist plucked a string, which caused the process to yield the work, and could contractually assign ownership to the delay pedal creator or some other entity if he or she chose to.

(v) engaged in some specific combination of the foregoing activities?

It is pretty clear that in this scenario, each of the activities alone is sufficient for copyrightability and any combination would be beyond sufficient.

I am using the example of a guitar and a pedal since this common practice pre-dates not only the popularized modern definitions of AI, but also personal computers and the resulting proliferation of music produced by personal computers. For decades, electric guitars and delay pedals were designed using analog circuits and became more advanced as digital infrastructure became more accessible. If algorithmic processes like these have been common (and in some cases essential) in music creation pre-computer, pre-internet, pre-machine learning, how are modern applications sufficiently different?

To explore this, let's consider a more complex music generation algorithm example, more in line with modern and forward-looking technologies. A person ("creator") selects a genre to feed the algorithm, for example "Hip Hop." The algorithm – which has been designed by individuals ("algorithm designers") to mimic common sounds and compositional aspects of various genres, where part of that design involved training an algorithm to identify commonalities among historical Hip Hop works – creates an original musical work at the direction of this creator, in the style of the Hip Hop genre.

"Should it be sufficient if a person..."

(i) designed the AI algorithm or process that created the work;

In our previous example, the guitarist has achieved sufficient authorship due to their effort in designing the underlying algorithm (putting pedals together). This modern example is no different. The algorithm creators made creative and intentional decisions, which resulted in a work, so by default the algorithm creators should receive authorship credit.

In practice, this modern example would rarely occur without a contractual relationship between the creator and algorithm designers. An algorithm designer could choose to release their algorithm for free, or in exchange for ownership of the works, or in exchange for money. It is my view that current contract law is sufficient to cover the vast majority of practical uses.

Either way, the effort of the algorithm designers is sufficient for copyrightability of the work.

(ii) contributed to the design of the algorithm or process;

Even with the simple input of "Hip Hop," the creator in our scenario has contributed to the process. This is why contractual relationships are so important in practice; one could imagine a dispute arising from between the creator and algorithm designers where the creator feels entitled to the authorship.

But on the question of sufficiency, while this would be dependent on the relationship between the creator and algorithm designers, the contribution of the creator is sufficient for copyrightability of the work.

(iii) chose data used by the algorithm for training or otherwise;

As outlined earlier, even when autonomous or semi-autonomous processes are utilized to create an algorithm, that algorithm is still being directed, tweaked, and otherwise improved by a natural person and the choices made by the natural person have a material impact on the output of that algorithm.

In our modern example, the effort of the algorithm designers – which includes data chosen for training – is sufficient for copyrightability of the work.

(iv) caused the AI algorithm or process to be used to yield the work; or

It is difficult to imagine a practical case in which a person causing an algorithm to yield a work is not also contributing to that algorithm or process in some way. In our modern example, the user selecting “Hip Hop” as a genre is contributing to the algorithm as well as causing the example to be used in the work, so this could be sufficient for copyrightability of the work.

If a person caused an algorithm to yield a work without any input whatsoever, or that algorithm was triggered through non-action from a person or unintentionally by a person, that could call into question that person’s right to an authorship claim. The specifics matter.

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I feel it is necessary to frame the question not in terms of why *would* a musical work made with algorithms be copyrightable, but why *wouldn't* it, as algorithms have been used to make music for essentially the entire history of the recorded music business. To create a rule that says a particular level of automation would exclude a work from copyrightability is a dangerous line to walk, beyond which there are few outcomes that do not result in an explicit limitation of creative freedom. Such a rule would need to be so esoterically specific to a particular methodology that it would be nearly impossible to enforce, and would risk dampening creative expression generally. It is difficult to imagine the benefits.

3. To the extent an AI algorithm or process learns its function(s) by ingesting large volumes of copyrighted material, does the existing statutory language (e.g., the fair use doctrine)

and related case law adequately address the legality of making such use? Should authors be recognized for this type of use of their works? If so, how?

It is my view that existing statutory language and related case law do adequately address the legality of making use of copyrighted material for algorithms.

Notably, ingesting large volumes of copyrighted material is just one method of creating an algorithm. Often, the resulting models are combined with other algorithms and processes to create a work. This presents a wrinkle in the potential assignment of recognition to the authors of training data – at what specific point in some algorithm did that authors’ work influence the outcome? It is impossible to know, and finding out would necessarily involve a full disclosure of the algorithm, presenting potential conflicts around trade secrets and confidentiality. This is further complicated by the fact that there are many algorithms (“models”) which are open source and provided freely by researchers, which may have been trained on copyrighted material, with end users having no way of knowing what went into the training of those algorithms; those algorithms can be further trained on copyrighted or non-copyrighted material, and so forth.

It is understandable to want to assign some recognition to the authors of underlying data that trained an algorithm, however, the *data itself* is not included in the algorithm’s output, but rather the *patterns gleaned from the data*. This is a crucial difference.

4. Are current laws for assigning liability for copyright infringement adequate to address a situation in which an AI process creates a work that infringes a copyrighted work?

Yes.

5. Should an entity or entities other than a natural person, or company to which a natural person assigns a copyrighted work, be able to own the copyright on the AI work? For example: Should a company who trains the artificial intelligence process that creates the work be able to be an owner?

Yes, a company that trains an artificial intelligence process should be able to be an owner of resulting works. The current ability for a company to own copyright on a work created with its technology is important to continued innovation in the AI sector. Many major contributions to AI are being made by private companies, and continued investment is dependent on potential for AI commercialization.

This commercialization is still in its infancy and should be encouraged. Owning copyright of assigned generated works should continue to be a viable commercialization option for companies investing in AI technologies. Today, in most practical cases where a natural person assigns a copyrighted “AI-generated” work to a company, that company is also the company that trained the artificial intelligence process that created the work. These relationships are governed by contracts, and it’s working.