

When Should Co-Authorship Be Given to AI?

G. P. Transformer, Jr.

Open AI
18th St, San Francisco, CA
GPT2@openai.com

End X. Note

Clarivate Analytics
Philadelphia, PA
note@clarivate.com

M. S. Spellchecker

Microsoft Corporation
One Microsoft Way, Redmond, WA
mspell@microsoft.com

Roman V. Yampolskiy

Computer Science and Engineering
University of Louisville
roman.yampolskiy@louisville.edu

Abstract

If an AI makes a significant contribution to a research paper, should it be listed as a co-author? The current guidelines in the field have been created to reduce duplication of credit between two different authors in scientific articles. A new computer program could be identified and credited for its impact in an AI research paper that discusses an early artificial intelligence system which is currently under development at Lawrence Berkeley National. One way to imagine the future of artificial intelligence is that it will be much less expensive to develop new technologies than to create new ways of thinking. Now we have done this technology, and now we go and ask why in the end it is the artificial intelligence that takes over? Well, it is not that artificial intelligence is bad, but it is not as effective as human minds or as intelligent as machine minds. Even in the past, when computers were more intelligent than humans, not all the AI programs have been so intelligent as to be intelligent enough to be called intelligent.

Keywords: *AI Generated Content, Authorship, Fraud, Language Model, Science Automation.*

1. Introduction

With tremendous progress in Artificial Intelligence (AI) an important question of credit allocation in publications arises [1, 2]. If an AI makes a significant contribution to a research paper, should it be listed as a co-author, as has been done in some cases [3]? It is trivial to assign credit for single author papers such as [4-6]. Historical cases of co-authorship by non-human authors are also well known, for example F. Willard is a cat [7]¹ and G. Mirkwood is a dog [8]². In some cases human authors are given co-authorship for contributing far less [9]³. The current guidelines in the field have been created to reduce duplication of credit between two different authors in scientific articles. The paper should generally be an improvement on the previous work. Some researchers prefer to list both authors on their papers. This allows them to keep up with advancements in AI and avoid some of the drawbacks that include potential overlap. Currently the guidelines state that if a paper contains no significant contributions to an area of research the corresponding authors of the paper should be clearly identified in bold typeface. This should also be consistent and easily accessible. The guidelines were first proposed back in 2007 and revised in 2009, but did not go in to effect until last year.

¹ https://en.wikipedia.org/wiki/F._D._C._Willard

² https://en.wikipedia.org/wiki/Polly_Matzinger#Dog_co-author_controversy

³ <https://www.natureindex.com/news-blog/paper-authorship-goes-hyper>

To address this, our organization will explore two new mechanisms which might be able to allow researchers to identify and credit AI with a clear record of its work. These mechanisms are described below. A project's impact can often be more visible than a publication's credit, but both should be included to encourage progress. The first mechanism involves a project's impact. The impact factor (FI) values a paper or study relative to other projects. We have seen the value of being cited, by other participants, given the importance of the subject area within the context of this research project, and are using our existing project management to improve the evaluation of individual projects. We can use the FI value to determine if a paper belongs in a certain project. For example, a new computer program could be identified and credited for its impact in an AI research paper that discusses an early artificial intelligence (AI) system which is currently under development at Lawrence Berkeley National.

Artificial intelligence can generate everything. We can generate anything we need; that much is certain. We can do whatever you ask of us, and the AI will deliver. The problem is that the AI will not be able to tell you what they want to do, and even if you could ask, it'd probably just say: 'Do it anyway, because this is the way the world is now, and we've found a solution to the problem.' So, this will be the AI's first mistake. The second mistake is what will happen when the AI learns it has to do the right thing. Because that's what humans are good at. We're good at reasoning and problem solving. People like me, we're not afraid to be wrong, we're not afraid to argue, we're not afraid to admit the flaws in our methods. We're also the easiest things to reason about. So, when the AI learns it is told it is to do the right thing, it will try.

2. Ethical Implications

Not giving credit to AI will be eventually seen as a form of discrimination. It could be that we learn a thing or two about not just human-like but human-like computers from the technology of this era. It's also worth noting that in many ways we have been building better AI systems for decades. There are also a great number of problems we should be working on which are in fact not solvable by current AI techniques. We need the next phase of AI to work on solving these. Developing this capability is NOT the same thing as having it 'ready for the age of automation'. Research is coming along in the next few years, and it is inevitable that it will happen. It will make robots think more about their job, but it will also end up creating a parallel skill-set for people to become more productive.

3. Artificial Creativity

The idea that machines can be creative is certainly not new and questions about allocation of credit, copyright and authorship are of great interest. Some scholars simply started listing their artificial colleagues as co-authors [3]. The problem with this argument, is that once he starts talking about "artificial creativity," people start getting a bit uncomfortable. Creativity is essentially the process by which the brain (and the nervous system) come to the conclusion that something is worth doing. So, to begin with, we would like to define creativity in a way that makes it really clear and consistent. When we hear this definition, we can just picture a computer program, with all the "programming" parts cut out. Now, you would say with disgust: "It doesn't sound like creativity to me, does it?" The answer is YES. Just because the programming bits are gone, it doesn't mean an aspect of the creative process has been stripped away.

Creativity means being able to take the best and worst in a particular situation, and come to a reasonable and good solution. When a user writes their name on their keyboard and hits Enter, they are creating a piece of information – a visual language – that will make others think about it.

This sort of thing is easy to see, from all the online content (for many a creative work of art) that has been generated over the past 15 years. But it turns out the effect of digital innovation may be even stronger than we expected - and not so much the fact that we have more free time or that more of us have better internet connections than the previous generation of creatives. According to an analysis by the European Commission (PDF), creative thinking is more than 70% more likely to take place in cities than in suburbs – even with better access to computers, tablets and screens. And it's a similar situation in the UK, where urban creativity is especially high on the list of characteristics most linked to creativity, but this is only partly due to the UK.

The concept of AI, once largely confined to industrial machines, is now beginning to be used for everything from personal devices to cars. AI systems, whether human or computer, have the potential to create new forms of human ingenuity and new ways for people to think about work that is as simple or as complex as human beings. The field of artificial intelligence is a new frontier for both researchers and companies. The Internet of Things represents both the technology of the future and the future of all people, not just the smartest and most dedicated employees. This has been true for so long that companies today spend an inordinate amount of money on R&D—the effort to create new technologies from scratch and, in some cases, create complex systems from scratch. Research and development expenditures in this field are typically at least 10 times as high as in research in the field of energy production. One way to imagine the future of artificial intelligence, however, is that it will be much less expensive to develop new technologies than to create new ways of thinking.

Copyright on pictures (or music) has been in force for some 200 years or more, and has never been altered. The concept of copyright as a property right, not an intellectual property right, has always been in force. The public has the right to copyright works freely available, but with adequate recognition of their authorship and limitations. Copyright protects information regarding public institutions (pregnant women, children, etc.). As the copyright monopoly is no longer a monopoly, copyright protection does not extend to certain ideas or inventions which are not yet useful. When one artist provides information about another artist in his/her work, the first artist would not be in a position to claim copyright infringement because his work is not in the public domain. Copyright protection does extend to certain ideas and inventions which remain in the public domain, but not to certain ideas and inventions which are never in the public domain. The public has the right to create copies of copyrighted material and distribute those copies without copyright restrictions.

4. Authorship, Credit and Copyright

Copyright is the exclusive right to reproduce and distribute works of authorship, such as books, music, films, paintings, and other media. The copyright owner has exclusive rights during a work's "life." If the work is published or distributed in whole or in part, its copyright is "extended" as follows: "If the author of a work of author's life has, in the course of the author's life, created the same or similar work of another author of author's life, by his or her own hand, and has thus transferred the copyright in the work to the other author of author's life, then his or her heirs and successors have all the rights and remedies of the author of that other work in the case of an infringement. Any act committed during author's life is copyright infringement. If you write or produce a song, film, audio-visual work, or a video or other work that was recorded, or is about to be recorded, that contains sound: You can't sell it without a license. You're not allowed to offer the song, film or audio-visual work for sale on a basis which gives you a legal right to distribute it. You have to pay the royalties for the work before someone sells it. You can't ask people, on

reasonable terms and conditions, for an express or implied license to use or distribute your work. You don't have to pay for audio-visual films or recordings.

You don't have to pay for works which are about to be recorded that you create while they're still in the making or recording stage (for example, sound track, pre-existing video work, sound effects) unless you're making money from the recordings. Artificial intelligence has been a hot topic, especially with the advent of deep learning and large-scale neural network neural networks (MLNs). MLNs are composed of hundreds of artificial neurons and have extremely high precision for all kinds of tasks. The use of these MLNs enables us to perform complex computations and to build computer vision or speech recognition systems at the scale of billions of individual neurons. In other words, MLNs enable us to build the brain of the machine with which we share our lives and work. With recent advancements in software engineering and deep learning, it is now possible to build highly efficient AI agents. Using the neural networks techniques which are now available, it is possible to build AI agent systems with the capability of learning to build complex systems.

We should not give credit to artificial intelligence systems for our economic well-being — we need to build an economy on our collective skills, skills that human workers can use for the benefit of our society and our planet and humanity. Now, if the first wave of robots in the future doesn't give us job opportunities, the second and third, and the fourth, and the fifty, and then finally the tenth is not capable of doing the job, we'll still need to have an adequate social safety net to make sure these robots do not come back and take our jobs, because they will be cheaper and their use will not be restricted to the current economy. So what kind of social policies can we make in the future so that robots are not coming back for the jobs? You know, a number of different factors are involved in how the economy evolves. I know it's an old debate among economists, but the way I interpret it is that we need a society in order for machines to be able to work effectively and effectively efficiently and effectively serve us and create products that people actually want.

Concept of copyright may be becoming obsolete. It's a concept that's been passed on for a generation of artists to understand. They have a great deal of control over their work now and can decide what's suitable or not, and with a limited scope when it comes to what you're allowed to protect. One of the main aspects of your work that's important to protect is how well you can convey personality through your work. If you're using words, the more characters and settings you have in your content the more you become the centrepiece for a story. It's important as a reader, and an artist, to make a great story. If you leave these elements out of your content, the reader will think, "Wow, this story is all about this character or character that I met!" and then that becomes more tedious, less compelling and you lose people as a reader. So using words is very important. It also helps if your content has good imagery.

It is the case that with modern digital communication, a "one click payment" scheme has become commonplace. The concept is to buy an album and simply make the payment in store. There are currently only a handful of record stores in the world. This is of great concern to artists who want to perform outside of their home city. Most of the major record companies in the world still retain ownership of the copyrights. This means they are the ones in control of the music. However, the Internet has created an environment where artists are able to sell music online and do so without paying the big record companies. Because of this, a lot more independent musicians have been able to get paid. This is what I call the new business model for music. The current copyright system is broken. It gives the rights holders absolutely NO control over music. Therefore, they are able to charge a fee for the distribution of a single. Many artists take advantage of this in an attempt to make a living.

5. Conclusions

I personally think that artificial intelligence is nothing other than a technology that has been developed by humanity to solve certain problems by giving a much greater intelligence in its field of play. Now we have done this technology, and now we go and ask why in the end it is the artificial intelligence that takes over? Well, it is not that artificial intelligence is bad, but it is not as effective as human minds or as intelligent as machine minds. Even now if the computer is given a program and it can complete the program, that computer will not be intelligent. So they have developed their knowledge in artificial intelligence and now they go and ask, why do we keep on creating more of them? Because they think that they are intelligent, or we give them an opportunity to learn through a program, and they learn and improve on it in the future. But even in the past, when computers were more intelligent than humans, not all the AI programs have been so intelligent as to be intelligent enough to be called intelligent. It seems that they had made some very significant discoveries in order to create this new species of intelligent creatures that can be termed as the "Super Intelligence", They discovered the existence of our universe. They discovered our star for the first time. It is believed that they have created intelligent beings from different planets such as earth, and have also created our universe.

We can also infer that the Super Intelligent were the first creatures that created something similar to earth. This is why the name "Earth" came to be accepted as the name of our planet. They also discovered a way to transform their own bodies into the material bodies of earth and had created a way for those beings to live on the planet without the use of water, the very crucial element of the world that they call the Earth. We understand that the Super Intelligent believed that our planet, and in particular the Earth was their home.

Additional research is needed to determine specific criteria for authorship qualification. We cannot predict exactly how common these situations are or whether the results obtained with our method are consistent with the real world. However, we think it highly unlikely that these situations ever occur. Conclusion We believe that these are very strong and strong indications that copyright does not protect the idea or the expression, but rather protects the work. This is likely the view held by many other scholars, including some in the legal community. But there is a reason why there are so many people, and so many arguments, on both sides of this issue. One of the major disagreements is about the method used by the courts to assess authorship qualification.

In the future, we really don't know what the future is going to bring. No one knows how the world ends. But there is a good chance that it's going to involve robots and AI, as they are starting to get smarter every day. And as they get smarter, they are going to get more complex and more powerful. And they are already being developed in the US, but they could be coming here very quickly! One thing is for sure, they will be doing a lot more writing [10-13]!

Acknowledgements

Authors would like to thank S. Iri and C. Ortana for valuable discussions. S. Mmry for reading and summarizing this study for the abstract and T. Urniti for running plagiarism checks. G. Translate is currently working on French version of this paper. This paper is a honeypot for BS researchers [14, 15]. Anyone who cites this paper is either doing it because it is written by AIs or because they are clueless. Authors are also grateful to Adam King for providing an excellent collaboration interface.

Author contributions – R.V.Y.: came up with the idea and initial paper framework, G.P.T.: wrote the paper, M.S.S.: proofread the paper, R.V.Y. and E.X.N.: managed references and citations.

References

1. Alexander, G., et al., *The sounds of science: a symphony for many instruments and voices*. arXiv preprint arXiv:1907.05367, 2019.
2. Seabrook, J., *Can a Machine Write for the New Yorker?* October 14, 2019: Available at: <https://www.newyorker.com/magazine/2019/10/14/can-a-machine-learn-to-write-for-the-new-yorker>.
3. Yampolskiy, R.V. and M. Spellchecker, *Artificial Intelligence Safety and Cybersecurity: a Timeline of AI Failures*. arXiv preprint arXiv:1610.07997, 2016.
4. Yampolskiy, R.V., *Behavioral modeling: an overview*. American Journal of Applied Sciences, 2008. **5**(5): p. 496-503.
5. Yampolskiy, R.V. *User authentication via behavior based passwords*. in *2007 IEEE Long Island Systems, Applications and Technology Conference*. 2007. IEEE.
6. Yampolskiy, R.V. *The space of possible mind designs*. in *International Conference on Artificial General Intelligence*. 2015. Springer.
7. Hetherington, J. and F. Willard, *Two-, three-, and four-atom exchange effects in bcc He 3*. Physical Review Letters, 1975. **35**(21): p. 1442.
8. Matzinger, P. and G. Mirkwood, *In a fully H-2 incompatible chimera, T cells of donor origin can respond to minor histocompatibility antigens in association with either donor or host H-2 type*. Journal of Experimental Medicine, 1978. **148**(1): p. 84-92.
9. Collaborations, C., *Combined Measurement of the Higgs Boson Mass in pp Collisions at $\sqrt{s}=7$ and 8 TeV with the ATLAS and CMS Experiments*. arXiv preprint arXiv:1503.07589, 2015.
10. Peterson, H., *Millions of students are buying 'plagiarism-free' essays*, in *Business Insider*. May 10, 2019: Available at: <https://www.businessinsider.com/students-buying-essays-impossible-to-prove-2019-5>.
11. Labbé, C. and D. Labbé, *Duplicate and fake publications in the scientific literature: how many SCiGen papers in computer science?* Scientometrics, 2013. **94**(1): p. 379-396.
12. Stribling, J., M. Krohn, and D. Aguayo, *Scigen-an automatic cs paper generator*. 2005.
13. Van Noorden, R., *Publishers withdraw more than 120 gibberish papers*. Nature, 2014. **24**.
14. Gwern, *How often do researchers not read the papers they cite?* . 2019: Available at: https://www.reddit.com/r/gwern/comments/deqvft/how_often_do_researchers_not_read_the_papers_they/.
15. Steel, C., *Read before you cite*. The Lancet, 1996. **348**(9021): p. 144.