

Artificial intelligence and publishing

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If I judge from the buzzwords I encounter frequently these days, from lunch conversations, seminar announcements, news headlines and research paper titles, I get an impression that the age of artificial intelligence (AI) has already arrived. According to the internet preprint site arXiv.org (<https://arxiv.org>), which I visit frequently, over 2,000 preprints closely related to AI were posted in the category of physics during the last twelve months. Note that most of these papers are not about the research of AI itself but about the application of AI to solving problems in physics. I found that this number grew exponentially during the last five years. Does this imply that AI techniques have been developed sufficiently so that they can be used to solve new physics problems? The majority of physicists I talked to seemed to disagree, claiming that AI-based studies had only confirmed some known results and not yet provided unanticipated solutions to new problems. Of course, there exist some areas of research where AI is definitely useful, such as big data analysis and material design. Nevertheless, some cautious people claim that AI cannot be as creative as humans and will never completely replace them. Is this true?

A famous event through which AI technology became known to the general public was the five-game Go match between AlphaGo and Lee Sedol held in Korea in 2016. I watched several matches on TV, where two professional Go players explained each move. I remember one occasion where the commentators said that a move by AlphaGo was extremely strange and it was perhaps a bad mistake. Later it turned out to be a brilliant move the two commentators agreed that no human Go player could possibly think of. I thought it was something similar to a new discovery in science and was well-qualified to be called creative. Will AI advance to such a degree that it becomes as creative as top-level scientists and creates new branches of knowledge? Will it become more intelligent than human beings someday? If humans can create something that is more intelligent than themselves, what kind of sense does it make in terms of the theory of evolution?

An important part of intelligence is the ability to process language. Since language is the main medium of publishing, it is not surprising that AI technology has been actively developed for and applied to the publishing industry. A large number of AI-based software tools aiming at assisting academic publishing have appeared recently. They can be used in all stages of journal publishing, including peer review, editing and production. Many big publishers such as Taylor & Francis, Elsevier and Springer Nature seem to be involved with developing various AI tools for publishing, in collaboration with software companies. Especially, the tools which can assist peer review processes are of great current interest [1]. These tools can be used to find peer reviewers, check statistics, provide a summary of a paper's findings, detect plagiarism and

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identify data and image fabrications, in a manner much better than traditional methods. I find manuscript analysis tools, such as the one being developed by ScholarOne and UNSILO, to be very interesting. They aim to analyze manuscripts using natural language processing and machine learning and provide an overview of a paper in relation to other papers on related problems, as well as to detect possible inconsistencies and plagiarism. I think if this kind of tool is developed successfully, it can be quite useful not only to editors but also to researchers and authors. A similar system can be used to provide researchers an overview of their paper, find the most appropriate references and even suggest new directions of research. In other words, it could effectively function as an AI research advisor. Nowadays the literature search is a substantial burden to researchers and the references quoted in many papers are not very accurate [2]. In my opinion, the current way of evaluating researchers and journals based primarily on the number of citations is seriously flawed and hurting the spirit of academism. AI-based tools may be able to provide an alternative better way to evaluate researchers and journals.

There are numerous other developments based on AI technology. Tools aiming to check statistics such as StatReviewer by Aries Systems and to automate and expedite manuscript editing and production processes such as Smart Edit by Cen-

veo are such examples. Since adopting AI-based tools requires large resources, it has largely been limited to big publishers. However, I expect the situation to change rapidly and more and more affordable tools for researchers, authors, editors and publishers to appear. Judging from the pace at which AI technology has evolved, I anticipate that it will completely change the ways scientists do research and publishers produce journals in a not very far future. Everybody including those in small publishers needs to be alert to AI technology.

Conflict of Interest

Kihong Kim has been the editor of *Science Editing* since 2014.

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