AI-based plagiarism detectors: Plagiarism fighters or makers?

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Abstract

Plagiarism damages the biomedical academic publication domain. Artificial intelligence (AI) is a rising hope in academic plagiarism hunting. However, new AI-based tools are available online to assist with plagiarising! This article presents plagiarism throughout history, especially in medicine, and the promises of AI to detect a new type of plagiarism, namely Aigiarism. The danger of the above-mentioned AI-based services to help in paraphrasing copied texts is also highlighted, including some proposed solutions.

Introduction

Automated medical report writing supported by artificial intelligence (AI) is gaining ground in clinical regulatory writing. Therefore, challenges and opportunities regarding streamlined medical writing software are rising. Such matters are also faced in the academic publication field. The most famous story is about the Swedish researcher Almira Osmanovic Thunström who asked Globally unique identifier Partition Table-3 (GPT-3) to write an academic paper about itself.[1] The paper was accepted by a journal, with ChatGPT listed as an author. More disturbingly, according to the structure of the sentences, it was demonstrated in 2021 that about 500 papers published in *Microprocessors and Microsystems* may have been written by GPT. This investigation was made possible by another machine learning engine, the RoBERTa base OpenAI Detector for GPT-2 output.[2]

While providing tools for unauthentic medical writing, one of the first academic automated software programs – now becoming more effective thanks to AI-guided functions – was used to detect plagiarism in theses or university assignments. Thus, AI is an efficient weapon against false works and plagiarism. More precisely, plagiarism is in fact the use or imitation of the language and thoughts of an author, without any authorisation or credit to the original author.[3] Although AI clearly represents a future hope in academic plagiarism chasing, free and new AI-powered services are spreading on the internet to help in plagiarising! This article presents aspects of plagiarism throughout history, especially in medical science, before debating two sides of the AI coin, both combatting and favouring plagiarism.

Plagiarism: *The Never-Ending Story*

For this section, we borrowed the title from the famous fantasy movie by Wolfgang Petersen,

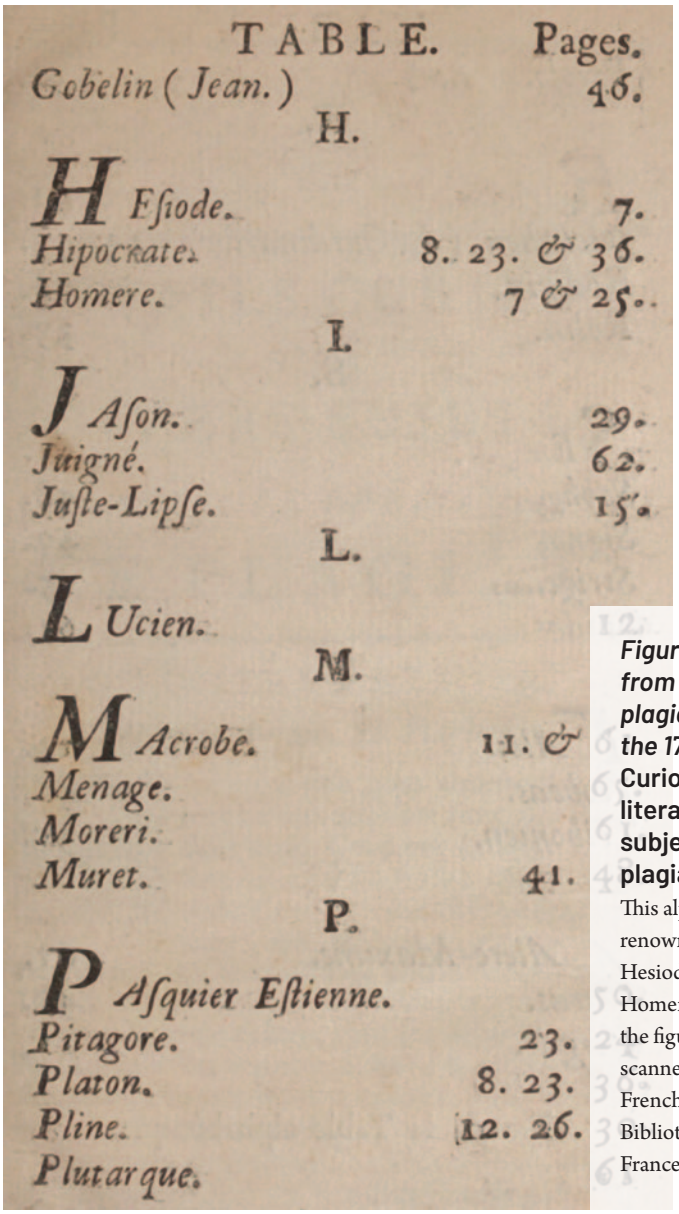


TABLE. Pages.

Gobelin (Jean.) 46.

H.

H Eſiode. 7.
Hipocrate. 8. 23. & 36.
Homere. 7 & 25.

I.

J Aſon. 29.
Juigné. 62.
Juſte-Lipſe. 15.

L.

L Ucien.

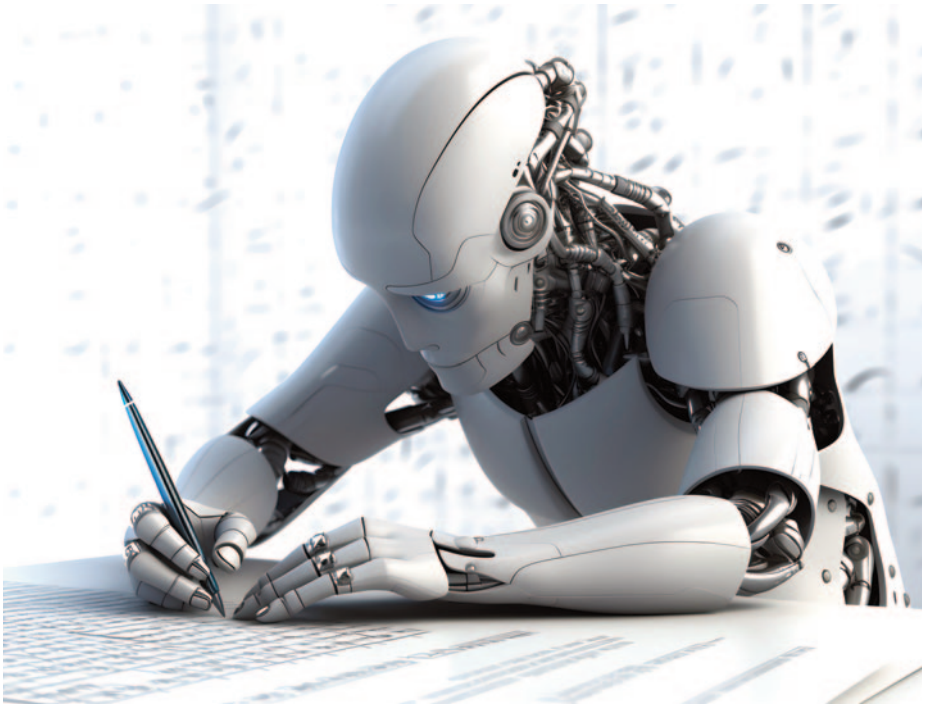
M.

M Acrobe. 11. &
Menage.
Moreri.
Muret. 41.

P.

P Aſquier Eſtienne.
Pitagore. 23.
Platon. 8. 23.
Pline. 12. 26.
Plutarque.

***Figure 1. Alphabetic table, from H to P, of the plagiarists mentioned in the 1741-dated book* Curious details on literature diverse subjects. First article: plagiarism.**
This alphabetic table displays renowned plagiarists, such as Hesiod, Hippocrates, and Homer. The book from which the figure comes was numerically scanned and diffused by Gallica, French database of the library Bibliothèque Nationale de France.



itself based on a German novel, for which the movie producer obviously bought copyrights. *The Never-Ending Story* is an amusing way to illustrate that plagiarism is as old as written culture. The 1741-dated book *Curious Details on Literature Diverse Subjects. First article: plagiarism* displays a table of plagiarists (Figure 1), in which some well-known writers are listed.[4] Despite the theme of this book, it is rather funny to note that it was written by an unknown author.

Plagiarism comes from the Latin word *plagiarius*, itself derived from *plagium*, meaning the theft of a human being.[5] A *plagiarius* is the crime of stealing a slave. The Latin poet Martial used such a metaphor to accuse another poet of verses imitation.[6] Yet, Figure 1, a 1741-edited document, is a good example that plagiarism, currently being a juridic ethical offence, is an 18th-century concept. Following the spread of the printing press, authors earned their lives without the support of arts and literature's generous benefactors. In the 18th century, plagiarism became juridically distinct from counterfeiting, and copyrights appeared for the first time in France under the initiative of dramaturgist Pierre-Augustin Caron de Beaumarchais.

The 1741-published book mentioned above is divided into chapters, including "Bought plagiarism"; "Free plagiarism"; "Involuntary plagiarism"; "Maimed plagiarism", etc. Well, nothing original. Plagiarism truly is a *Never-Ending Story*, which plagiarises itself for centuries.

Science is cool but cruel!

Although plagiarism emerged from the literary world, it also concerns science and is even included in academic misconduct. More precisely, it is one of the three reported frauds: Falsification, Fabrication, and Plagiarism (FFP).[7] The first two (FF) are misconduct involving the scientific data. If FFP is detected within a published academic paper, the editor is required to retract the article. In 2021, Professor Gonzalo Marco-Cuenca and his collaborators revealed that in Europe, 60.83% of the articles retracted due to FFP are from the Life Science and Biomedicine field.[8] The biomedical field is especially competitive regarding funding, and the pressure to publish more and more creates bad practices in biomedical research.

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Some prestigious researchers were plagiarists, such as the French chemist and microbiologist Louis Pasteur. He plagiarised his works on silkworms from Dr Antoine Béchamp; on anthrax from Dr Henry Toussaint; and "his" worldwide famous rabies vaccine from Dr Pierre-Victor Galtier.[9] Pasteur filed a patent for the rabies vaccine without having mentioned Galtier. Pasteur deposited his notes to the French "Académie des sciences", having instructed them not to open them before a hundred years following his death. (All of his plagiarism was publicly disclosed with his notes.[9]) Additionally, the scientific working environment exacerbates sociological disparities. For instance, the Matilda effect is the minimisation of the contribution of women scientists, whose works are credited to men, and was first described by feminist Matilda Joslyn Gage. One of the most widely known cases is British physicochemist Rosalind Franklin, never cited for her significant achievements in the DNA structure discovery.[10] Those examples are plagiarism of ideas or denial of contributions. Such stories tend to hide what science is: *a collective work*.

Very importantly, due to the "Publish or perish" situation in academia and "copy-paste" bad habits, another category of plagiarism, namely the plagiarism of text, became one of the top reasons for biomedical retractation. This was divulged in an Indian study,[11] and recently confirmed by a Brazilian analysis.[12] Plagiarism of text may include self-plagiarism, which is the reuse of work previously submitted as a strategy to increase the number of publications.

AI-based plagiarism detectors: tools against Aigiarism...

First, let us discuss plagiarism detectors. Software for academic plagiarism detection has been used by universities since the nineties. In some institutions, master's theses are mandatorily screened by antiplagiarism algorithms before being submitted for evaluation.[13] These internet-based university detection systems are not accessible to students. Such evaluation applications encourage students to insert quotation marks, cite sources, and mention authors in their essays. Nowadays, this kind of software is also routinely run by academic biomedical editors, like Elsevier or Springer Nature.[14] An issue is emerging: the use of AI in medical writing. The above-mentioned plagiarism detectors are now combined with machine learning operations to identify and quantify AI writing within a text. Nevertheless, these AI-driven options are mostly available to lecturers.[15] The story plagiarises itself: the problem originated in universities and then spread to academic biomedical publications.

Undoubtedly, AI-based AI writing detectors will be an extraordinary tool to uphold the

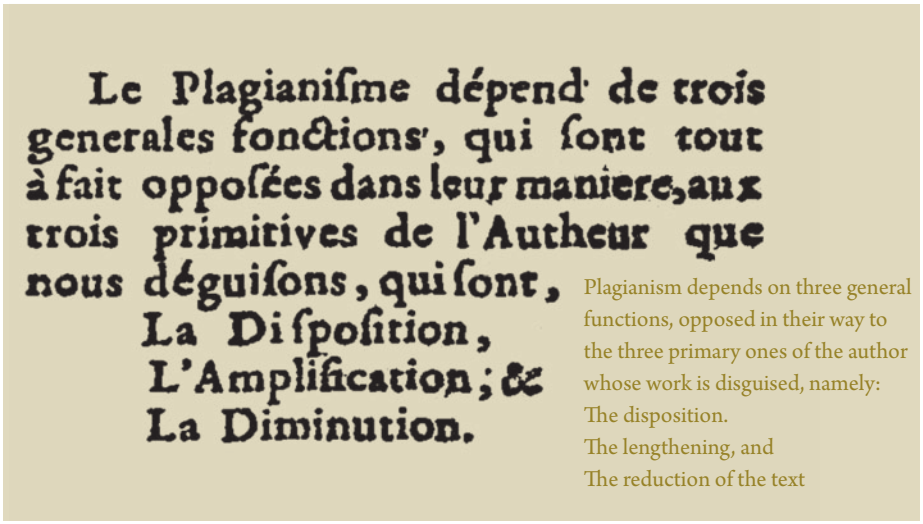

Figure 2. An extract of the French 1667-published book* The mask of speakers or the manner to easily disguise any sort of speech, *translated into English.
On the left: the screenshot extract defines *plagianism*, a French word invented by author Jean de Soudier de Richesource. On the right: translation into English of the screenshot extract. The translation has been done without any AI-based assistance. The book from which the figure comes (left part) was numerically scanned and diffused by Gallica, French database of the library Bibliothèque Nationale de France

writing integrity of medical articles. Furthermore, as they hunt AI-written texts, in which AI is not cited as an author, they unveil a new type of plagiarism: Aigiarism, meaning the use of AI to generate content and present it as one's own work. "Aigiarism" is a word created by American manager Mike Waters. To fight against Aigiarism, again, AI will help. The research company OpenAI is working on a watermarking scheme, to make it harder to take any GPT output without mentioning it.[16] AI technology is thus the best way to combat AI-mediated violation of biomedical literature ethics.

... Or plagiarism promoters?

Let us try to understand the "work" of a plagiarist. In the 17th century, Jean Oudart opened in Paris a school of *plagianism*, a term he had invented. In 1667, he published his method under the pseudonym of Jean de Soudier de Richesource, "The mask of speakers or the manner to easily disguise any sort of speech".[17] A pseudonym containing the word "source" is quite ironic for writing a book that provides advice to plagiarise! Figure 2 illustrates what plagiarism (*plagianism*) has been over the centuries.

The 1667-edited method, from which comes Figure 2, is divided into sections. One explains how to change the order of words (The disposition). This section contains specific paragraphs that praise synonymy with examples: courage can be replaced by virtue to disguise a text. Other sections teach how to lengthen a speech, for example by adding definitions of several words, or how to cut some parts. Now, imagine that AI was able to perform these time-consuming tasks, done for centuries (Figure 2). This is currently possible with recent online AI-guided "plagiarism fixers". For example, the platform ©Check-Plagiarism.com offers a free AI-powered paraphrasing service,[18] as well as the website ©Plagiarismremover.net.[19] In 2021, the YouTube™ channel Insights4UToday released two videos to demonstrate the use of such tools, with provocative titles like "How to avoid plagiarism while copying" or "Copy & paste and not get caught".

This could have remained a sad and insignificant story, except that YouTube™ channels promoting AI-driven paraphrasers are openly designed for researchers, themselves producing scientific literature. One of the above-mentioned videos starts this way, "This video is purely for educational purposes. Plagiarism is very unethical. You must cite all sources used."[20] However, the engines for rephrasing supported by machine learning are fast, free or cheap, easy to use, and attractively interfaced.

With the pressure to publish, such problems are affecting academic medical writing. In the future, watermarking schemes and the juridic requirement not to take any output from these tools without mentioning them might be the answer. This component would be technically hard to apply, but – once again – the issues may be solved thanks to AI innovations.

Other AI challenges in medical writing

As AI promotes plagiarism and helps against Aigiarism, as discussed in the previous sections, other AI challenges in medical writing are rising. Above all, we must keep in mind that AI is definitively valuable for all its perspectives in biomedical discoveries. For instance, in Germany, the group of Professor Peter Krawitz developed a deep learning machine to improve the diagnosis, in terms of speed and objectivity, of leukaemia.[21] In addition, AI is becoming the new paradigm in drug discovery, especially because it can predict the features of a compound.[22] That said, concerns are growing about scientific papers entirely written by AI. As aforementioned, AI helps against Aigiarism, but AI technologies are getting more sophisticated and ultimately, will be undetectable to AI writing detectors.

> The submission and publication of content created by AI, language models, machine learning, or similar technologies is discouraged, (...) and is not permitted without clear description of the content that was created.

The smartsciencecareer.com platform published an article on methods to more quickly write scientific papers. Professor Sven Hendrix, author of the article and founder of smartsciencecareer.com, cites cactus.ai, a Large Language Model (LLM) text generator able to include references in academic essays, even as he warns that it is not precise enough for scientific publication.[23] Yet, Hendrix says that these functions are going to improve soon. Coping with this generalised utilisation, the Journal of the American Medical Association (JAMA®) recently updated its publication policy to discourage authors from submitting AI-generated text, as quoted below.[24]

Another kind of Aigiarism may exist, based

on Generative Adversarial Network (GAN) AI, through the creation of fake biomedical pictures, such as microscopy, endoscopy, and biochemistry images.[25] This scientific misconduct is hard to detect,[26] which makes it unquantifiable. Some researchers are warning the scientific community that this misconduct will be the next data fabrication stratagem, and call for preventive solutions from machine intelligence algorithms.[25]

Concluding remark

This article has been written without any AI support. The Editor option of Microsoft® 365 Word, an AI-enabled writing assistant, displays 86% of correct writing for the whole text. It seems an AI decided that the article you just finished was good enough to be read!

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The author declares no conflicts of interest.

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