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EDITORIAL

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Editorial

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Writing in the era of large language models:
a bibliometric analysis of research field

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Abstract: The widespread adoption of large language models (LLMs) and chatbots over the past two years has significantly altered writing practices. This editorial paper aims to conduct a bibliometric analysis of the interdisciplinary research field concerning various aspects of writing in the context of LLMs. A search was conducted in the bibliographic database Scopus in December 2024 using the following query: (“large language model*” OR “LLM” OR “*GPT”) AND “writing”. We included studies published since 2020 and limited our search to articles, conference proceedings, books and book chapters. The search yielded a total of 1,629 documents. The retrieved records were analyzed using the R package bibliometrix and VOSviewer software. By employing these tools in combination, we identified the most relevant sources, leading countries and institutions, analyzed the most cited publications of the collection and constructed topical clusters. Our findings indicate that the most prominent research topics include the authorship and plagiarism in academic writing, challenges in second language education, automated writing evaluation, and issues related to creative writing in the context of LLMs.




Keywords: Large language model; ChatGPT; Writing; Bibliometric review; bibliometrix R-package; VOSviewer; Scopus database; Keyword co-occurrence

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Письмо в эпоху больших языковых моделей:
библиометрический анализ предметного поля

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Аннотация: Появление и бурное развитие больших языковых моделей и чат-ботов, наблюдающееся в последние два года, кардинально изменило практику письма. Цель этой редакционной статьи – провести библиометрический анализ междисциплинарной области исследований, связанных с различными аспектами письма в эпоху больших языковых моделей (LLM). Поиск был проведен в библиографической базе данных Scopus в декабре 2024 года с использованием следующего запроса: (“large language model*” OR “LLM” OR “*GPT”) AND “writing”. Мы включили в анализ исследования, опубликованные с 2020 года, и ограничили наш поиск статьями, материалами конференций, книгами и главами книг. Поиск дал 1629 документов. Полученные записи были проанализированы с использованием R-пакета *bibliometrix* и программного обеспечения *VOSviewer*. С использованием данных инструментов нами были определены наиболее продуктивные и цитируемые исследователи, институты и страны, а также наиболее значимые работы. На основе различных методов анализа совместной встречаемости ключевых слов, реализованных в данных инструментах, нами была построена концептуальная структура предметного поля, а также определены исследовательские тренды. Мы пришли к выводу, что темы, связанные с авторством и плагиатом в академическом письме, проблемами обучения второму языку, включая автоматизированную оценку текстов на иностранном языке, вопросами креативного письма в эпоху LLM, являются наиболее популярными темами, находящимися в фокусе внимания исследователей.

Ключевые слова: Большие языковые модели; ChatGPT; письмо; Библиометрический анализ; Библиотека *bibliometrix* на языке R; *VOSviewer*; Scopus; Ключевое слово

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1. Introduction

Large language models (LLMs) represent sophisticated artificial intelligence systems that are engineered to process and generate natural language. These models are constructed using deep neural network architectures and are trained on extensive corpora of text, allowing them to discern patterns in language usage and generate coherent responses. The advent of LLMs has had a substantial impact on the writing practices and the academic study of writing.

The objective of this editorial paper is to systematically analyze the literature related to the study of writing in the context of LLMs through the application of a bibliometric approach. This analysis seeks to identify the most prominent countries, sources and institutions as well as key topics and emerging trends within the examined research field.

We conducted a bibliometric analysis of scholarly articles that examined writing within the context of LLMs, utilizing the Scopus database. The research was conducted using the R package *bibliometrix* (Aria and Cuccurullo, 2017) in conjunction with the standalone application *VOSviewer* (Van Eck and Waltman, 2014). This bibliometric analysis encompasses a total of 1629 articles published over the past four years (2020-2024) and represents the first effort to provide statistical insights into the research status and trends regarding the use of LLMs in various aspects of writing.

2. Methods

The search string utilized in the title, abstract, and keyword sections of the article fields for data extraction from Scopus was as follows: (“large language model*” OR “LLM” OR “*GPT”) AND “writing”.

The data collection process for this study was conducted on December 21, 2024. Since 2020, there has been a notable increase in the number of published papers, with more than five papers published annually, in contrast to only two papers published in 2018. As a result, we selected for further analysis those papers published between 2020 and 2025. Furthermore, we focused on specific types of publications, which include: 1) articles; 2) conference papers; 3) book chapters; 4) books.

A total of 1,629 documents were retrieved from this search.

For the purpose of further analysis, all accessible bibliographic information for the 1,629 retrieved records was extracted from Scopus and exported in both CSV and BibTeX formats.

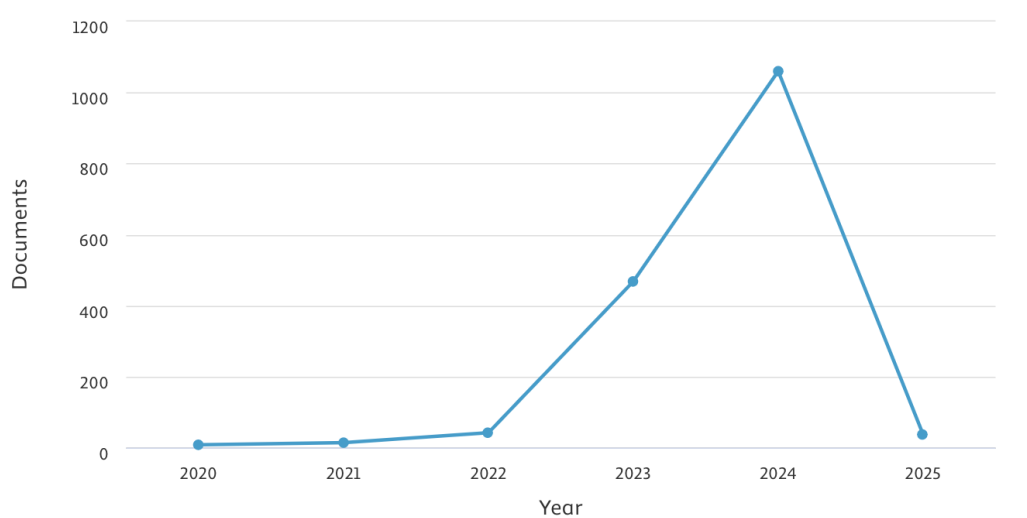
3. Results and Discussion

3.1. General structure of the collection

The field of writing within the context of LLMs has undergone considerable evolution over the past two years, as depicted in Figure 1. Specifically, 42 papers were published in 2022, followed by 468 in 2023, and over 1,000 papers published in 2024.

Figure 1. Document growth by year

Рисунок 1. Динамика роста числа статей по годам

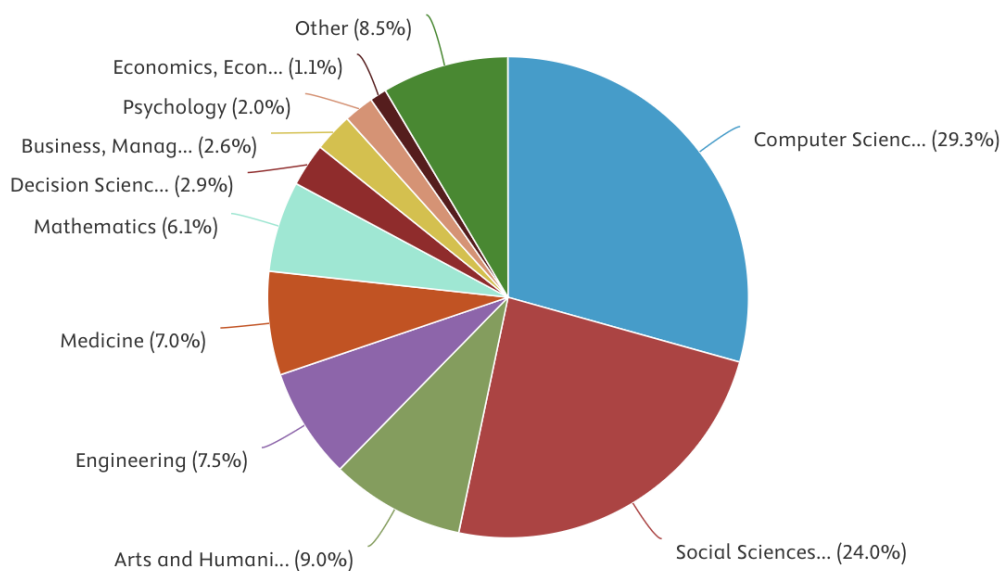


More than half of the papers consist of articles (57,2%), while over a third of the collection comprises conference papers (39,2%). The remaining contributions include book chapters and books.

The majority of the papers in our collection are published in journals and conference proceedings that align with the domains of computer science and social science (see Figure 2), thereby highlighting the interdisciplinary nature of the field.

Figure 2. Distribution of the papers over subject areas

Рисунок 2. Распределение статей по предметным областям

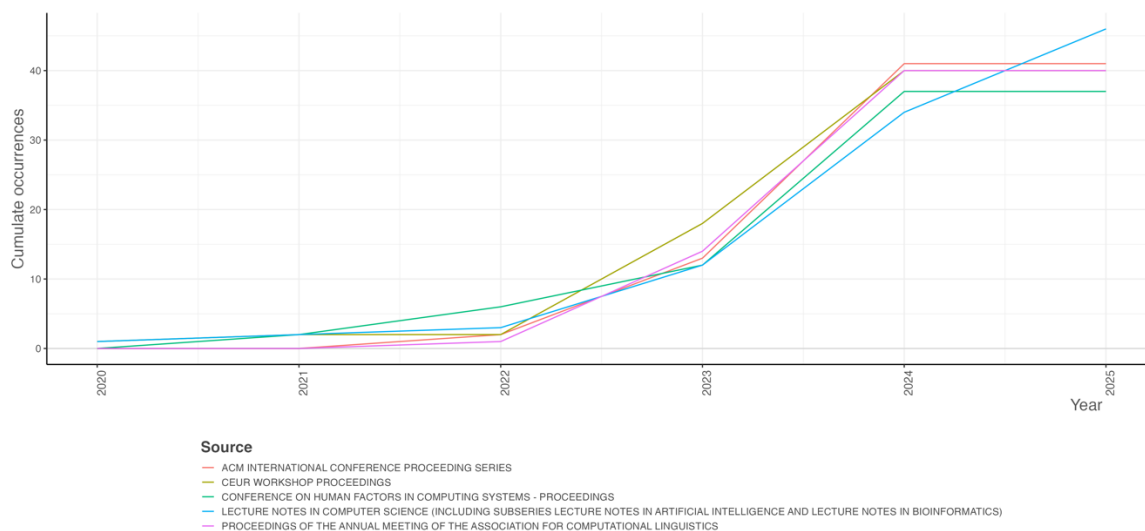


3.2. Most relevant sources

The most pertinent sources specifically those with the highest volume of publications pertaining to writing in the context of LLMs, are illustrated in Figure 3. This figure

additionally depicts trends in publication dynamics, revealing a distinct overall increase in the number of papers associated with each publication source.

Figure 3. The most pertinent sources of the collection and source production over time
Рисунок 3. Издания с наибольшим числом статей



It should be noted that the Conference on Human factors in Computing systems has the highest impact factor within the collection (H index = 10). The ACM Proceedings and Proceedings of the Annual Meetings of the Association for Computational Linguistics rank second (H index =6).

3.3. Leading countries and organizations

In the analyzed domain, several countries and universities emerge as leaders both in the volume of published papers and the number of citations. Notably, the United States, China, and the United Kingdom are identified as prominent contributors (see Figures 4-5). It is important to highlight that

while the United States leads in both productivity and citation metrics, China ranks fourth in citation count but second in the number of papers. United Kingdom and India have less paper published than China, but they garnered a higher number of citations. National Science Foundation is the foremost funding agency, having supported 60 papers, while other U.S. agencies, including Department of Defense and Department of Health and Human Services collectively funded an additional 30 papers. Furthermore, two Chinese funding bodies, namely the National Natural Science Foundation of China and the Ministry of Science and Technology of the People's Republic of China, collectively supported more than 100 papers.

Figure 4. Leading countries (over corresponding author)

Рисунок 4. Страны с наибольшим числом статей в коллекции (по корреспондирующему автору)

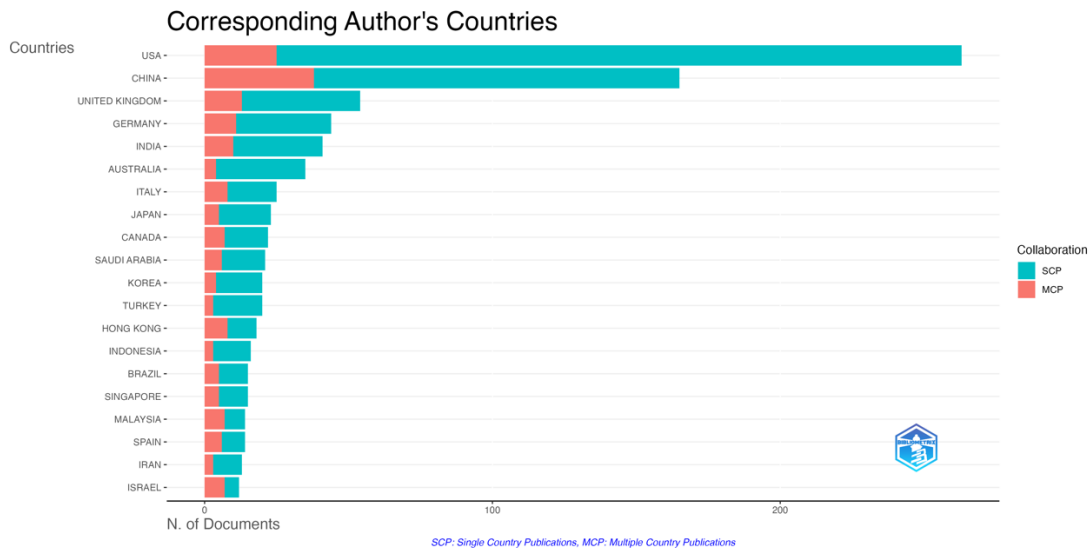


Figure 5. Most cited countries

Рисунок 5. Страны с наибольшим числом цитирований

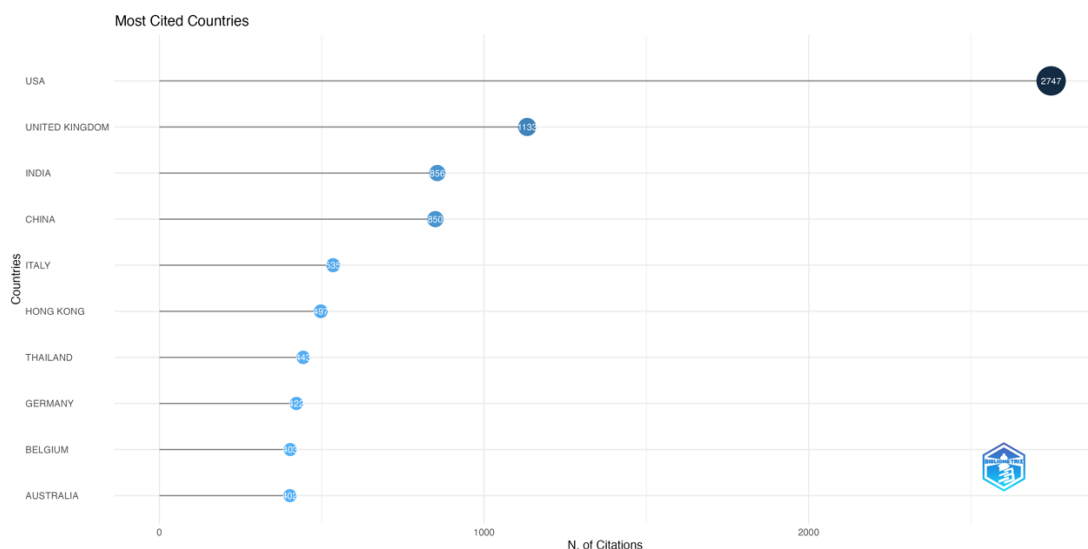
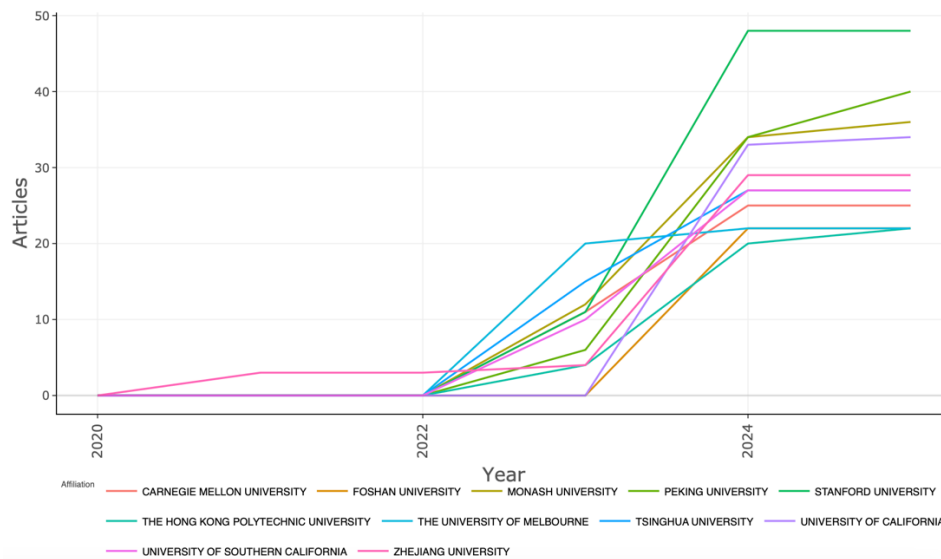


Figure 6 illustrates the most productive organizations in terms of research output. Notably, there is a general trend indicating increase in the number of publications across

all organizations beginning in 2023. Among these, the leader – Stanford University – exhibits most pronounced upward trajectory publication volume.

Figure 6. Most productive affiliations
Рисунок 6. Организации с наибольшим числом статей



3.4. Highly cited publications

The most frequently cited document within the collection as indicated by Global Citations Metrics which means the total citations that an article, included in the collection, has received from documents indexed in the bibliographic database (Scopus in our case) is “Chatting and cheating: Ensuring academic integrity in the era of ChatGPT” with more than 600 citations (Cotton et al., 2023). This paper explores the opportunities and challenges associated with the utilization of ChatGPT in higher education, while also addressing the potential risks and benefits of these tools. Furthermore, study examines the complexities involved in detecting and preventing academic dishonesty.

The paper that examines the potential applications and limitations of LLMs in healthcare is the second most cited document in our collection, with a total of 471 citations (Cascella et al., 2023). Other highly cited papers on a global scale address various topics, including the utilization of AI chatbots in scientific writing (Salvagno et al., 2023), the progressive workflow processes associated with the ChatGPT tool (Haleem et al., 2022), university students’ perceptions of generative AI (GenAI) technologies, such as ChatGPT, within the context of higher

education (Chan et al., 2023). Additionally, the paper with considerations regarding the academic integrity related to students’ use of AI tools employing Large Language Models (LLMs), such as ChatGPT in formal assessments are highly cited (Perkins, 2023). A systematic review for an up-to-date examination of artificial intelligence (AI) in higher education (Crompton and Burke, 2023) is also among highly cited papers of the collection as well as the paper which presents the results of topic modeling of the tweets about ChatGPT during its initial post-launch (Taecharungroj, 2023). Among highly cited papers there are publications which compare scientific abstracts generated by ChatGPT with actual abstracts (Gao et al., 2023), discuss Codex, a deep learning model trained on Python code that generates solution code in response to natural language input (Finnie-Ansley et al., 2022).

The most frequently cited document of the collection defined by local citation metrics, which refer to the number of citations received by a reference article internally to the collection itself, examines the potential benefits and risks associated with ChatGPT and other NLP technologies in the context of academic writing and research publications (Dergaa et al., 2023). Additionally, highly cited documents within collection investigate

behaviors and reflections of second language (L2) writing learners in their exposure to ChatGPT in writing classrooms (Yan, 2023), present a text editor that enables users to collaborate with a generative language model to co-create a story (Yuan et al., 2022). Lastly, they raise critical questions regarding the intellectual property implications and the potential for GPT-3 to facilitate instances of plagiarism (Dehouche, 2021).

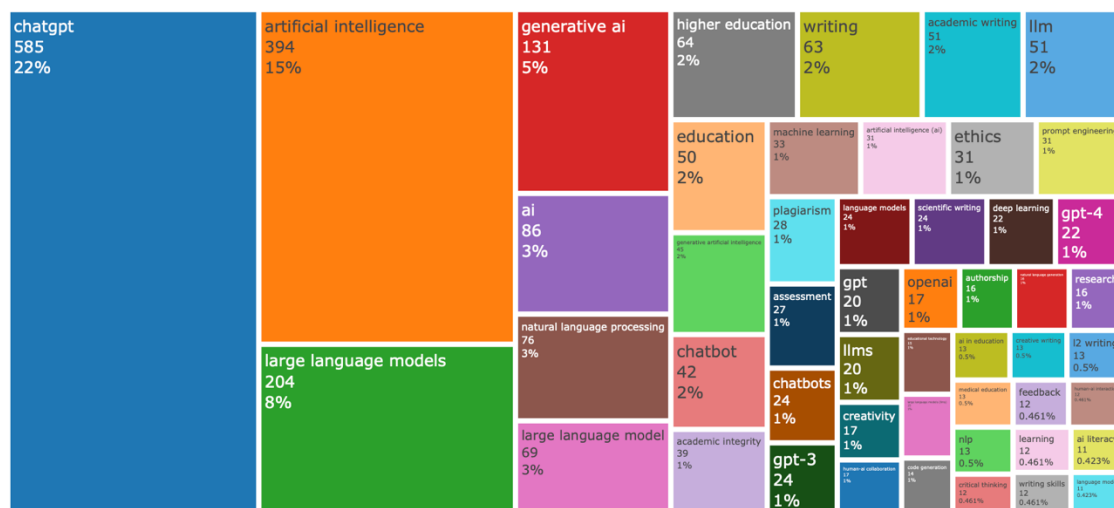
Among the most locally cited references are GPT-4 Technical Report¹, a paper that suggests the integration of ChatGPT into classrooms focused on argumentative writing (Su, 2023) and a discussion of thematic

analysis in psychology (Braun and Clarke, 2006). Highly cited references include a paper by H. Else who discusses abstracts written by ChatGPT (Else, 2023), a publication by J. Barrot who reflects on the potential impacts of ChatGPT, as well as similar AI tools, on education in general and second language (L2) writing in particular (Barrot, 2023).

3.5. Topical structure of the collection

Figure 7 illustrates the most frequently occurring author keywords within the collection, which delineate its overarching knowledge structure and serve as a proxy for its thematic map.

Figure 7. Most frequent author keywords of the collection
Рисунок 7. Наиболее частотные ключевые слова коллекции



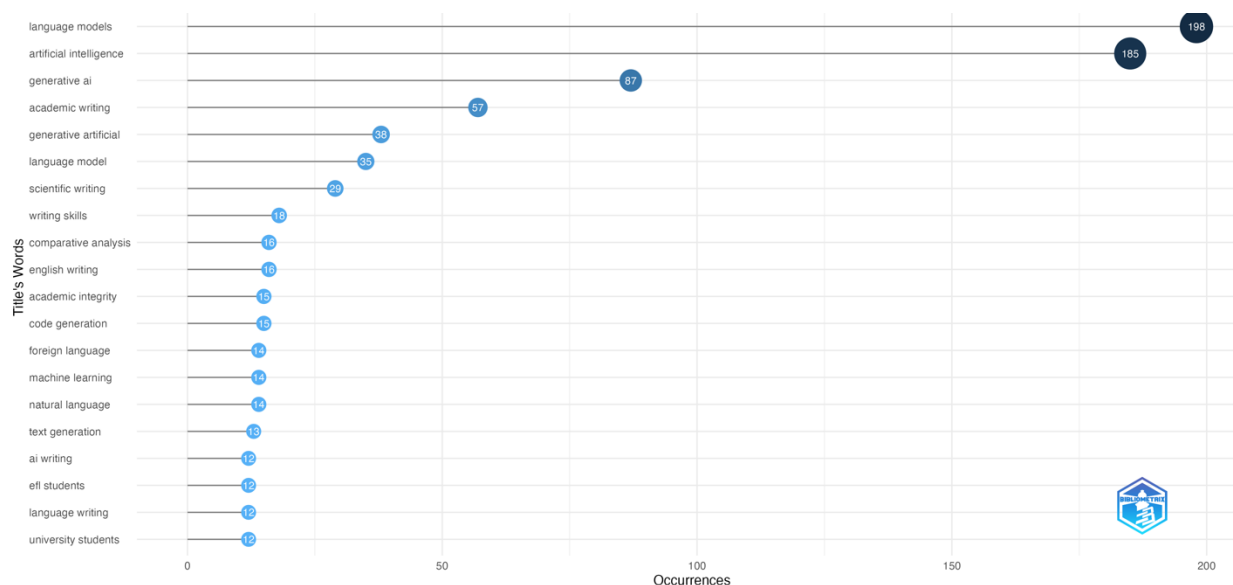
Titles represent a critical component of the academic papers; therefore, we compiled a list of the most frequently occurring bigrams in the titles within our collection (see Figure 8). The data indicates that issues related to

academic writing in the context of LLMs are among the most prevalent concerns identified in the collection, alongside challenges associated with writing in a second language.

¹ OpenAI (2023), GPT-4 Technical Report, accessed 20.12.2024

Figure 8. Most frequent bigrams in the titles

Рисунок 8. Наиболее частотные биграммы в названиях статей

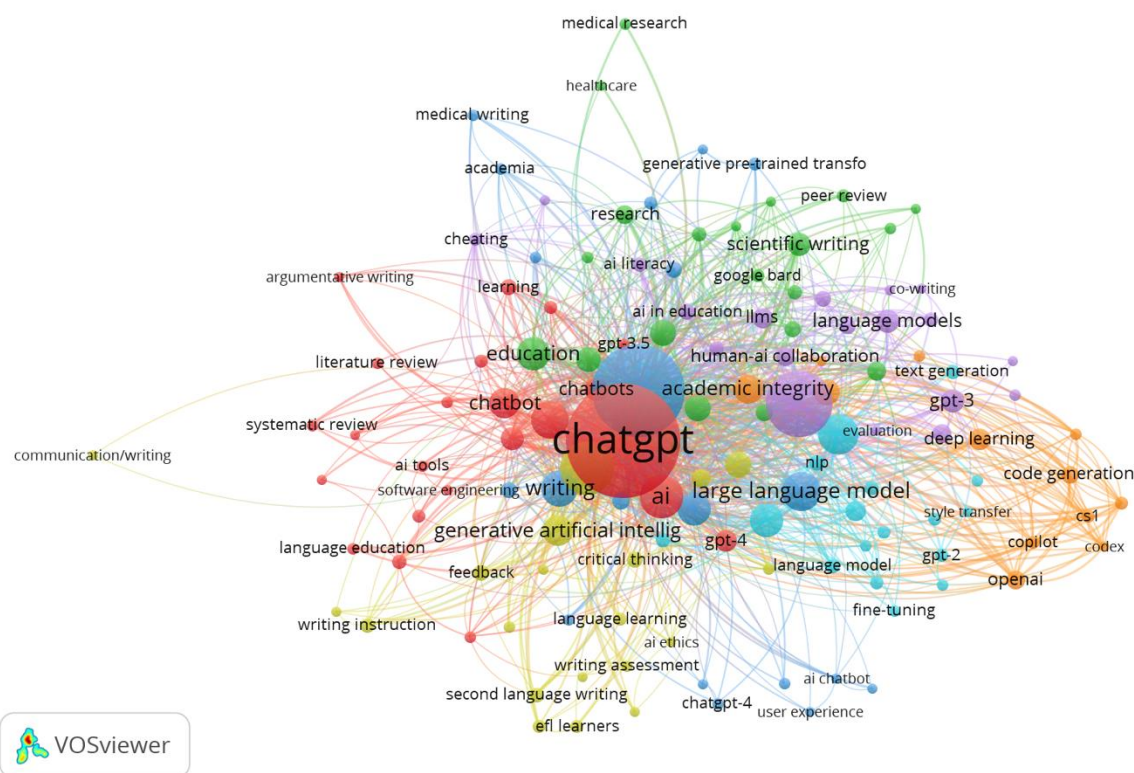


The visualization generated by VOSviewer, which is based on the co-occurrences of author keywords (see Figure 9), illustrates multiple clusters of topics present within our collection.

The largest – red – cluster (23 terms) addresses issues related to the challenges of AI tools including chatbots in higher education context, specifically for language education, including the problems of automated evaluation of writing in a second language, automated essay scoring. The second largest cluster, depicted in green (21 terms) concerns with the challenges posed by the problems of the use of LLMs in academia. The problems of ethics of the use of LLMs in academic context are examined, particularly issues related to authorship and plagiarism, especially in the realm of medical research. The third cluster represented in blue and containing 20 terms discusses the general challenges associated with the application of

LLMs for medical education and medical writing. Cluster 4 illustrated in yellow and comprising 20 terms, addresses issues related to creativity, second language writing, automated feedback during writing assessments, writing pedagogy and writing proficiency. Cluster 5 represented in purple and consisting of 19 items, focuses on the challenges of creative writing, including poetry, co-writing with LLMs, and human-AI collaboration more broadly. Cluster 6 depicted in light blue and containing 17 terms is associated with challenges in text classification and style transfer using transformer models, including the issues related to fine-tuning and data augmentation. Finally, Cluster 7, represented in orange and comprising 12 terms, discusses the challenges of utilizing LLMs for code generation and programming education, as well as broader issues related to digital literacy.

Figure 9. Keyword co-occurrences
Рисунок 9. Кластеры ключевых слов



The analysis of the dynamics of topics conducted using VOSviewer and bibliometrix indicates that research interest is currently concentrated on issues related to ethics of the use of LLMs in writing, automated essay scoring in the context of EFL, problems of text classification including AI-generated texts.

Conclusions

This editorial employs a combination of the bibliometrix R package and VOSviewer to provide a brief overview of the rapidly evolving research domain concerning the study of writing as both a process and a product in the context of LLMs. Our review indicates a notable upward trend in the number of publications within this field over the past two years (2023 and 2024). It is reasonable to anticipate that this trend will persist at least in the foreseeable future. The predominant topics associated with the application of LLMs in writing pertain to the opportunities and challenges that arise in relation to their use for second language

writing, its automated evaluation and feedback, as well as issues surrounding the use of LLMs in academic writing, including ethical considerations, authorship and plagiarism. A significant number of papers are devoted to the discussion of LLMs within the context of medical education and medical writing. Additionally, the challenges of creative writing and LLMs as co-writers are extensively examined. As this field continues to develop, the focus of research attention is shifting from the issues related to code generation to concerns surrounding artificial intelligence ethics, second language writing, and its automated evaluation.

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