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# THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN LANGUAGE MODELS IN CIVIL ENGINEERING UNIVERSITY EDUCATION: THE CASE OF CHATGPT

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## Abstract

*A documentary review was carried out on the production and publication of research papers related to the study of the variables Artificial Intelligence, University Education and ChatGPT. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the year 2023, achieving the identification of 21 publications. The information provided by this platform was organized through graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics have been described, the position of different authors towards the proposed theme is referenced through a qualitative analysis. Among the main findings made through this research, it is found that Australia with 6 publications was the country with the highest scientific production registered in the name of authors affiliated with institutions in that country. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of Artificial Intelligence and its integration into teaching models in university education, was Social Sciences with 17 published documents, and the Type of Publication most used during the period indicated above were Journal Articles with 76% of the total scientific production.*

**Keywords:** Artificial Intelligence, University Education, ChatGPT

## Introduction

In recent years, rapid advances in artificial intelligence have created transformative changes in various industries and the field of civil engineering is no exception. The integration of AI technologies into educational environments has revolutionized the way students learn and apply knowledge, providing unprecedented opportunities to foster innovative solutions to complicated engineering challenges. AI-based language models like GPT-3.5 have become invaluable tools that allow civil engineering students to access vast amounts of information, improve problem-solving skills, and revolutionize the way they participate in the lesson.

Language models like GPT-3.5 are sophisticated artificial intelligence systems capable of

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understanding natural language, generating human-like responses, and simulating human intelligence. They have the ability to analyze large data sets, including research papers, manuals, and industry reports, to produce coherent and contextually relevant information. Through this integration, civil engineering students can benefit from a personalized learning experience, access to cutting-edge research, and real-world applications, all of which are essential to prepare for the next generation of technical professionals.

In this context, the integration of AI-powered language models into academic training in civil engineering is a promising step towards a more efficient and effective learning process. This article explores the main benefits and challenges associated with the application of AI technologies in civil engineering curricula. It examines how language models enhance traditional teaching methods, facilitate critical thinking, and foster collaborative learning environments. While the integration of AI-based language models has great potential, there are still a number of challenges that need to be addressed, including concerns about data privacy, the need for constant updates to reflect the latest technical developments, and ensuring the ethical use of AI to avoid potential deviations. However, the integration of AI-powered language models into undergraduate civil engineering education represents a creative shift in the way students learn and interact with engineering concepts. By leveraging the capabilities of these cutting-edge technologies, civil engineering students can deepen their understanding of their field, enhance their problem-solving skills, and be better equipped to respond to the challenges of a rapidly changing industry. Bringing AI to language models as a valuable educational tool is an imperative step for universities to prepare future generations of civil engineers for an increasingly controlled world. For this reason, this article seeks to describe the main characteristics of the compendium of publications indexed in the Scopus database related to the variables Artificial Intelligence, University Education and ChatGPT, as well. As the description of the position of certain authors affiliated with institutions, during the period 2023.

## **General Objective**

Analyze from a bibliometric and bibliographic perspective, the elaboration and publication of research works in high impact journals indexed in Scopus database on the variables Artificial Intelligence, University Education, ChatGPT during the year 2023.

## **Methodology**

This article is carried out through a mixed orientation research that combines the quantitative and qualitative method.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of the scientific production corresponding to the study of Artificial Intelligence, University Education, ChatGPT.

A qualitative perspective, examples of some research works published in the area of study indicated

above, starting from a bibliographic approach that allows to describe the position of different authors towards the proposed topic. It is important to note that the entire search was performed through Scopus, managing to establish the parameters referenced in *Figure 1*.

### ***Methodological design***



**Figure 1** Methodological design

**Source:** Authors.

### ***Phase 1: Data collection***

Data collection was executed from the Search tool on the Scopus website, where 41 publications were obtained from the choice of the following filters:

- TITLE-ABS-KEY ( chatgpt, AND environment )
- Published documents whose study variables are related to the study of Artificial Intelligence, University Education, ChatGPT.
- Limited to the year 2023.
- Without distinction of country of origin.
- Without distinction of area of knowledge.
- Regardless of type of publication.

### ***Phase 2: Construction of analysis material***

The information collected in Scopus during the previous phase is organized and subsequently classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

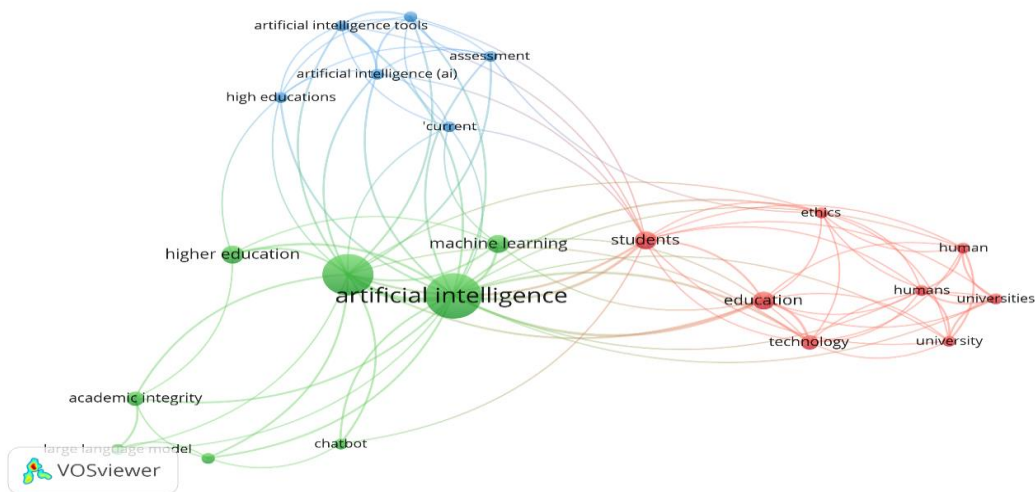
### *Phase 3: Drafting of conclusions and outcome document*

In this phase, we proceed with the analysis of the results previously yielded resulting in the determination of conclusions and, consequently, the obtaining of the final document.

## Results

### *Co-occurrence of words*

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.



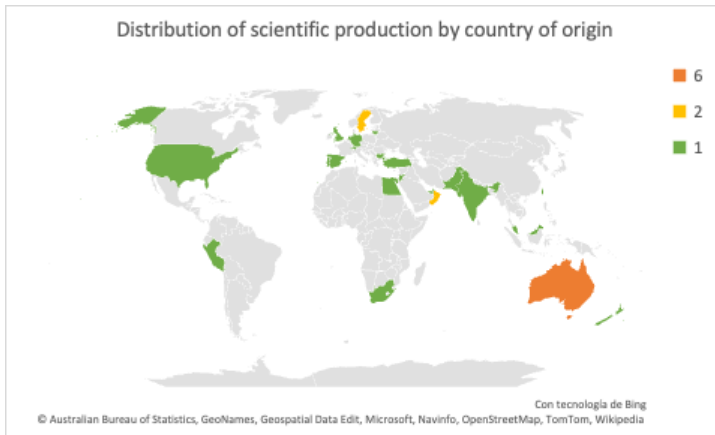
**Figure 2** Co-occurrence of words

**Source:** Own elaboration (2023); based on data exported from Scopus.

Artificial Intelligence was the most frequently used keyword within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Higher Education is also among the most frequently used variables, associated with variables such as Machine Learning, Students, Technology, Academic Integrity. AI-powered language models can be adapted to each student's interests and learning style, adapting lesson content and problem-solving methods to meet their needs. This personalized learning approach not only enhances students' understanding, but allows them to progress at their own pace, fostering a deeper understanding of fundamental concepts and encouraging independent learning.

### *Distribution of scientific production by country of origin*

Figure 3 shows how scientific production is distributed according to the country of origin of the institutions to which the authors are affiliated.



**Figure 3** Distribution of scientific production by country of origin.

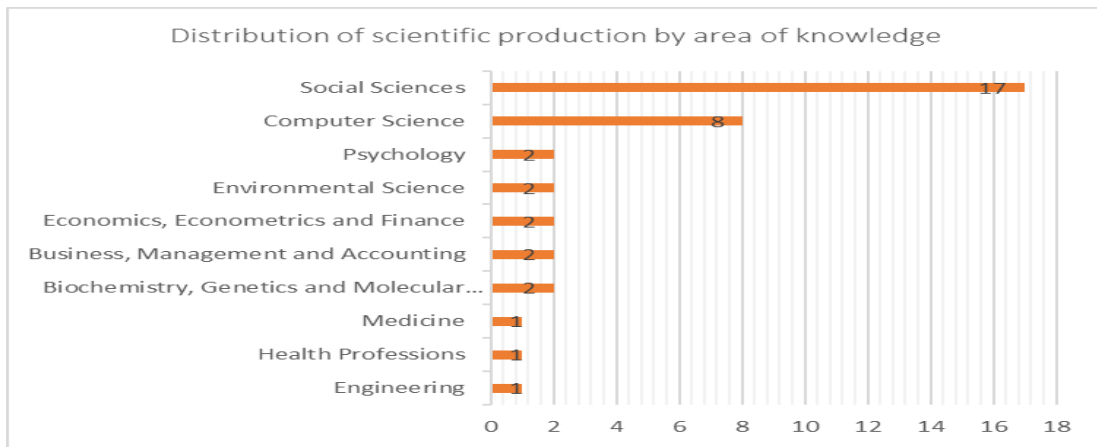
**Source:** Own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, records from institutions were taken into account, establishing Australia, as the country of that community, with the highest number of publications indexed in Scopus during the period 2023, with a total of 6 publications in total. Secondly, Hong Kong with 2 scientific papers, and Bulgaria ranking third presenting to the scientific community, with a total of 1 papers among which is the article titled "A comprehensive education framework on AI policies for university teaching and learning" This study aims to develop an AI education policy for higher education by examining perceptions and implications of generative text AI technologies. Data were collected from 457 students and 180 faculty and staff from various disciplines at Hong Kong universities, using both quantitative and qualitative research methods. Based on the findings, the study proposes an AI green education policy framework to address the multifaceted implications of integrating AI into university teaching and learning. This framework is organized into three dimensions: pedagogical, governance and operational. The pedagogical dimension focuses on the use of AI to improve teaching and learning outcomes, while the governance dimension addresses issues related to privacy, security and accountability. The Operational dimension addresses infrastructure and training issues. The framework fosters a nuanced understanding of the implications of integrating AI in academic settings, ensuring that stakeholders are aware of their responsibilities and can take appropriate action accordingly. (Chan, 2023)

#### ***Distribution of scientific production by area of knowledge***

Figure 4 shows the distribution of the elaboration of scientific publications from the area of

knowledge through which the different research methodologies are implemented.



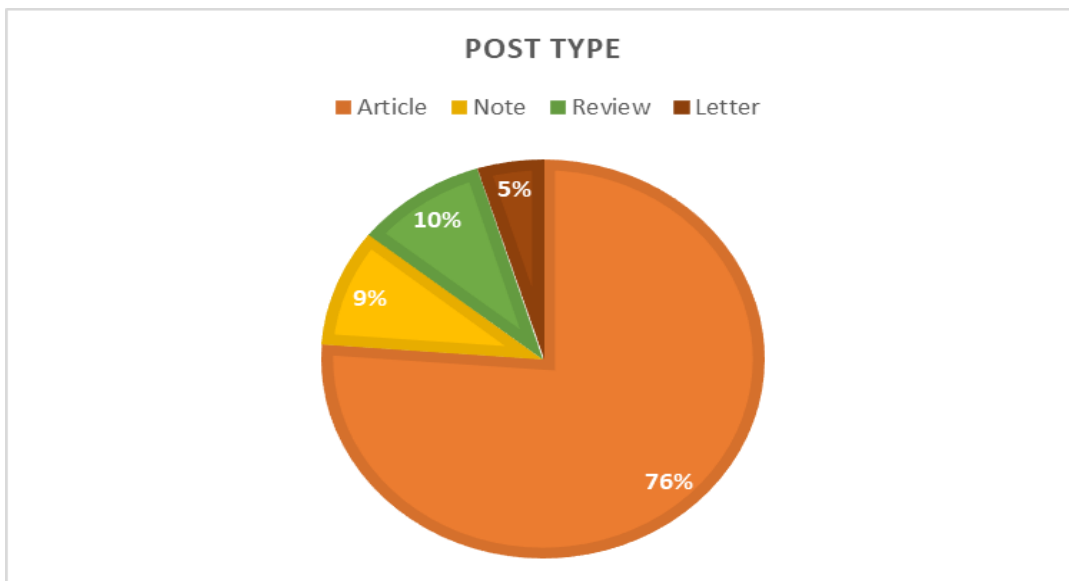
**Figure 4** Distribution of scientific production by area of knowledge

**Source:** Own elaboration (2023); based on data provided by Scopus

Social Sciences was the area of knowledge with the highest number of publications registered in Scopus with a total of 17 documents that have based their methodologies Artificial Intelligence, University Education and ChatGPT. In second place, Computer Science with 8 articles and Psychology in third place with 2. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was registered by the Social Sciences area entitled "Game of algorithms: implications of ChatGPT for the future of tourism education and research" The document aims to evaluate the ways in which ChatGPT will disrupt tourism education and research. Design/methodology/approach: This is a concept document. Findings: ChatGPT has the potential to revolutionize tourism education and research because it can do what students and researchers should be doing, i.e. generate text (assignments and research papers). Universities will need to reevaluate their teaching and assessment strategies and incorporate generative language models into teaching. Editors will need to be more receptive to manuscripts partially generated by artificial intelligence. In the future, digital teachers and research assistants will take over many of the cognitive tasks of tourism educators and researchers. Originality/value: To the best of the authors' knowledge, this is one of the first academic articles to investigate the implications of ChatGPT for tourism education and research.(Ivanov, 2023)

***Type of publication***

In the following graph, you will observe the distribution of the bibliographic finding according to the type of publication made by each of the authors found in Scopus.



**Figure 5** Type of publication.

**Source:** Own elaboration (2023); based on data provided by Scopus.

The type of publication most frequently used by the researchers referenced in the body of this document was entitled Journal Articles with 76% of the total production identified for analysis, followed by Note with 9%. Journal are part of this classification, representing 10% of the research papers published during the period 2023 in journals indexed in Scopus. In this last category, the one entitled "Applications of ChatGPT in medical, dental, pharmaceutical and public health education: a descriptive study highlighting the advantages and limitations" stands out. The objective of this descriptive study was to investigate the advantages and disadvantages of the use of ChatGPT in medical, dental, pharmaceutical and public health education. Based on expert panel discussion and review of existing literature, specific and concise ChatGPT indications were constructed and responses were generated on February 25, 2023. Our data suggested that in medical education, the benefits of ChatGPT included the possibility of improving personalized learning, clinical reasoning, and understanding of complex medical concepts. Benefits listed in the context of dental education included improved skills through step-by-step instructions and interactive content, with instant feedback on students' techniques. In pharmaceutical education, advantages included possible explanations of complex topics and the deployment of interactive tools that helped develop skills for patient counseling. In public health education, the benefits listed included providing explanations and case scenarios, as well as improving skills in data analysis and literature review. The limitations listed based on content generated by ChatGPT were common across all healthcare disciplines investigated and included data privacy issues, risk of generating biased and inaccurate content, and risk of impaired critical thinking and communication skills among healthcare students.

The expert panel found the content generated by ChatGPT partially useful in the context of health education. However, the content generated by ChatGPT overlooked several important points regarding the pros and cons of using ChatGPT in medical, dental, pharmaceutical, and public health education, including: the risk of plagiarism, copyright issues, the risk of academic dishonesty, and the lack of personal and emotional interactions needed to develop proper communication skills in health education. (Sallam, 2023)

## Conclusions

Through the bibliometric analysis carried out in the present research work, it was established that Australia was the country with the highest number of records published for the variables Artificial Intelligence, University Education and ChatGPT. with a total of 6 publications in Scopus database. Similarly, it was established that the application of theories framed in the area of Social Sciences, were used more frequently in the integration of artificial intelligence in language models in the training of civil engineering degrees, since this represents a significant advance in the way in which students access and use knowledge in this discipline. The incorporation of language models based on artificial intelligence, such as chatGPT, in the educational field has proven to be a promising tool for improving the quality of learning and improving the skills to solve civil engineering problems. One of the main benefits of artificial intelligence in education is its ability to generate accurate and relevant content and commentary. Students can access up-to-date information, practical examples, and detailed explanations to understand complex and difficult civil engineering concepts. This allows them to deepen their understanding of subjects and apply this knowledge more effectively in academic projects and work. However, it's important to note that while artificial intelligence is a powerful tool, it shouldn't completely replace traditional education. Language models should be used as a complement to help teachers create a richer and more effective educational environment. Interaction with teachers and peers remains essential for the development of essential skills, teamwork, and personal growth.

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