



# The Role of AI in Economics Education: An Analytical Review of Current Status and Future Outlook

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**Abstract.** Artificial intelligence (AI) is perceived to significantly contribute to various aspects of human life. One of the domains influenced by this technology is education. This paper discusses how AI's current role can contribute to society's access to education. To understand how AI impacts education, we evaluated based on a literature review from the Scopus database, utilizing bibliometric methods and VOSviewer as an analytical tool. The bibliometric results indicate that studies on AI and economics education are still relatively few. The findings also show that the United States and China are the most productive countries in researching AI and economics education. Further analysis using VOSviewer reveals numerous articles discussing the impact of AI on educational outcomes, such as student performance and its effects on universities or colleges, including its influence on educators. On the other hand, discussions regarding AI's role in educational and economic transformation have received less attention, presenting an opportunity for further exploration. The bibliometric analysis presented provides relevant information on the main themes studied about economics education and AI technological advances in development.

**Keywords:** AI, Economics Education, Bibliometrics Analysis.

## 1 Introduction

The Fourth Industrial Revolution has had a significant impact on human life. Rapid advancements in technology have influenced various aspects of human existence, including the field of education. In the current era, one of the most prominent and attention-grabbing technologies among individuals is Artificial Intelligence (AI). This technology has become a hot topic in numerous academic and industry discussions, particularly concerning its potential to enhance effectiveness and efficiency across various sectors, including education.

The presence of Artificial Intelligence undeniably plays a significant role in helping students gain access to education, including the study of economics. Generally, Artificial Intelligence itself can affect how students learn [1]. The presence of AI has been proven to assist students in understanding material more deeply, allowing them to learn in their own style, thereby improving their outcomes [2][3].

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The study of economics plays a crucial role in equipping students with a deep understanding of economic principles, data analysis, and critical thinking skills. In this context, AI offers a range of tools and techniques that can enrich the learning experience and enhance educational outcomes. For instance, AI algorithms can be used to develop adaptive learning systems that tailor the material and teaching methods based on individual student needs. This enables a more personalized and effective approach to the learning process.

Additionally, AI can assist in educational data analysis. By collecting and analyzing data from various sources, AI can provide deeper insights into student learning patterns, identify challenges faced by students, and recommend better teaching strategies. This not only helps teachers design more effective curricula but also offers better support for students in understanding difficult material.

Implementation of AI in economics education can also be seen through the development of more realistic and interactive economic simulations and models. With the help of AI, these simulations can be made more complex and accurate, providing a deeper and more practical learning experience for students. Students can interact with these models, conduct virtual experiments, and see firsthand how economic theories are applied in real-world situations. This not only enhances students' conceptual understanding but also prepares them to face real-world challenges.

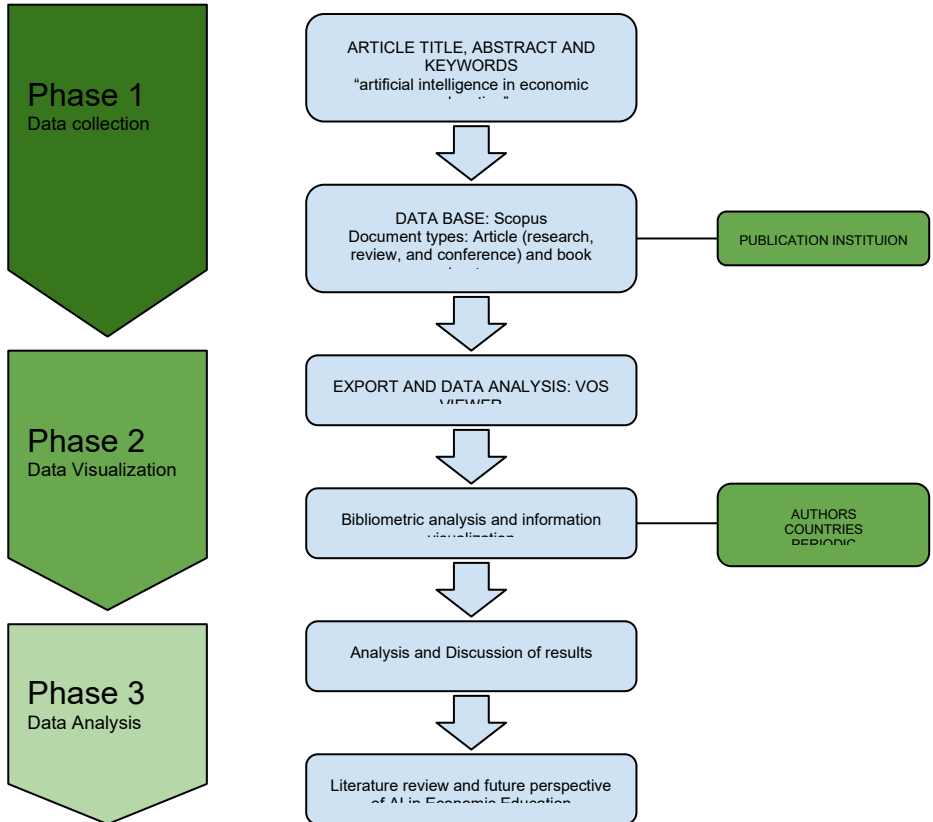
In order to investigate the current state of the art on artificial intelligence in economics education and to provide guidance on emerging trends in studies related to AI, a search was carried out in the Scopus database and is presented in this work. The goal is to assess source of publications, articles, journals, authors, countries and institutions, research areas and the most cited themes about AI in economics education. This paper provides essential information on emerging trends in research involving AI. This paper also identifies trending topics that might be interesting as research areas. The rest of the paper is organized as follows: in section 2 we present the methodology applied to retrieve documents in the Scopus database and generate bibliometric networks. Section 3 presents the results and discussion of the data retrieved in Scopus. Additionally, Section 4 reviews the literature on the current state of the art and the main perspective for research involving artificial intelligence and economics education based on the analysis of keywords.

## 2. Methodology

To comprehend the impact of artificial intelligence (AI) on economics education, we employed a literature review method augmented by bibliometric analysis to construct a comprehensive framework and provide insights derived from previous studies and research. The literature review method encompasses several stages, including problem formulation, literature collection, analysis, and synthesis of final results. The bibliometric method, first introduced by [4], aims to establish connections between articles based on citations [5].

Initially, a search was carried out in the Scopus database and the evaluation of the obtained documents was divided into three phases (Figure 1): (Phase 1) definition of search criteria to identify records in the Scopus database and refinement of re-

trieved records (data collection phase); (Phase 2) the documents were exported to the Vos Viewer Software for bibliometric analysis of publications, authors, countries, institutions journals, and areas (data visualization phase); and (Phase 3) data analysis to identify the main themes discussed in research developed about AI and economic education



**Fig.1.** Methodology phases and their main steps and analyzed criteria applied to the present work

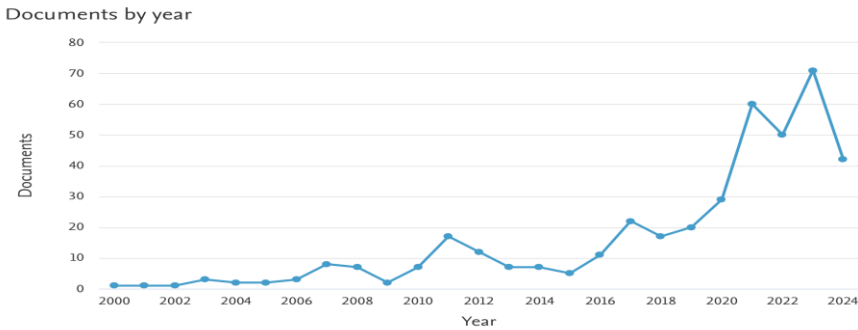
**2.1 Data Sources**

To initiate the literature review analysis, the data sources used in this study were derived from the Scopus database. There are several reasons for selecting the Scopus database. Besides its inclusion of high-quality, reputable journals, this database provides access to a wide range of journals from multiple disciplines, making it an ideal reference for literature search. The use of Scopus as a data source is also based on prior studies that utilized the same database and justified its selection for similar reasons [5] [6]; [7]; [8].

To obtain the relevant article data, we employed several keywords to facilitate the formation of our analysis. The keywords used included "Artificial Intelligence and Economics," and "Effect of Artificial Intelligence on Education," among others. To generate the bibliometric analysis results, we utilized the VOSviewer tool to produce both the analysis and the visual representation of the bibliometric data.

### 3. Results and Discussion

As mentioned above, the search in the Scopus database retrieved 407 documents and publications on “artificial intelligence economic education” for the period 2000 to 2024. Both the cumulative index and the number of publications show an upward trend in the period investigated (Figure 2). The analysis reveals that from 2000 to 2016, the number of publications related to the discussion of AI in economics education appears limited, averaging approximately 10 to 20 articles per year. There was a noticeable increase in publications post-2017, continuing through the latest year of 2024, reflecting the rise of AI as an alternative source of learning materials, particularly prominent from around 2020 onwards. While there is a slight decrease noted from 2023 to 2024, overall, the trend in AI discussions shows an upward trajectory starting from 2015 through 2024.

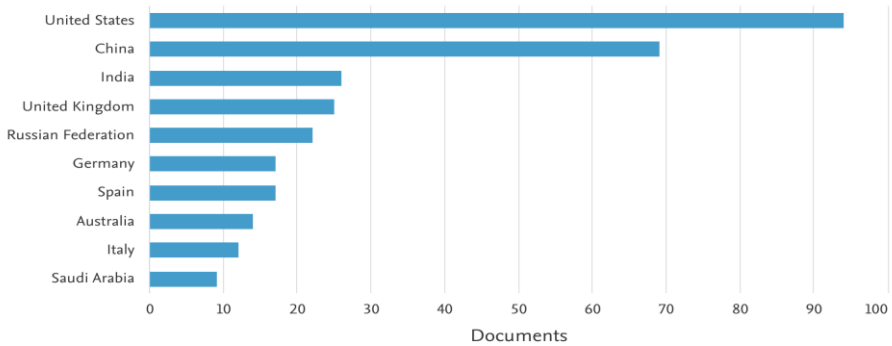


**Fig.2.** Quantitative distribution of publications in artificial intelligence economics education, 2000-2024

In terms of document types, the 407 publications are categorized into conference paper (45,5%); article (35,1%); review (5,4%); book (3,7%); book chapter (3,4%); editorial (2,2%); note (1,7%); retracted (1,0%); short survey (1,0%); conference review (1,0%). The result reveals that there are still few reviews on the subject, which justifies the development of this presented work. Discussions on Artificial Intelligence in economics education are currently predominantly led by the United States, followed by China.

Documents by country or territory

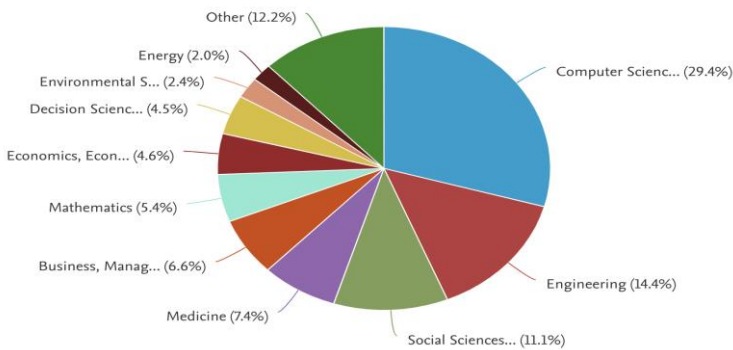
Compare the document counts for up to 15 countries/territories.



**Fig.3.** Distributions of the top 10 countries based on the number of documents

As illustrated in the Fig. 3, from 2000 to 2024, the United States has dominated with 94 articles, followed by China with 69 articles. Below them, India, the United Kingdom, and Russia follow with 26, 25, and 22 articles respectively. Other countries contributing significantly include Germany, Spain, Australia, Italy, and Saudi Arabia.

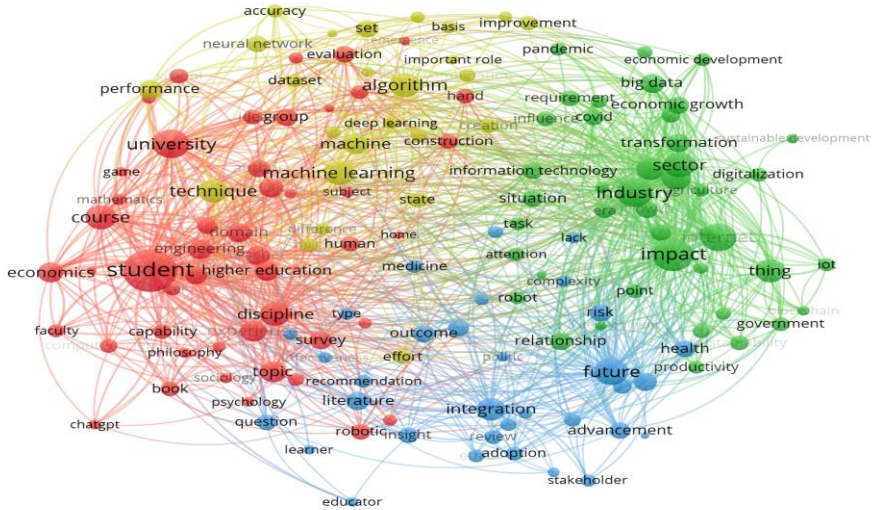
Documents by subject area



**Fig.4.** Distributions of the documents based on the subject area

However, when examining by subject area, discussions on AI are still predominantly within articles related to Computer Science at 29.4%, followed by Engineering at 14.4%. Discussions of AI in economics, econometrics, and finance only constitute 4.6%, indicating a limited focus on AI in the field of economics, as evidenced by the usage of AI-related terms in economic articles being only 4%. Figure 4 remains low





**Fig.6.** Network Visualization of the documents based on total link strength

To verify the scope of work and main themes of research related to economic education AI, it is important to get inside of each document and extract their main keywords. This analysis is essential to determine trends in emerging themes and identify hotspots that might be interesting as areas of innovation, research, and development. The analysis of keywords related to economic education AI generated 17,153 total link strength (see Fig 6).

This mapping analysis used a minimum 10 number of occurrences of a term, from the total 10,734 terms, only 249 terms meet the threshold, followed by only 149 terms selected. The keywords obtained were classified into four clusters. Cluster 1 includes economics and education; Cluster 2 includes the industry sector; Cluster 3 includes future integration; and Cluster 4 includes machine learning. The primary keywords represented in this cluster tend to focus on economics education and AI technology. Figure 7 shows the classification of the keywords into four clusters suggesting diverse focus areas and priorities in economics education and the use of advanced technologies like AI. Cluster 1 emphasizes developing educational programs rooted in economic theory and practice. Cluster 2 highlights the need to tailor curricula to industry demands, ensuring graduates have relevant skills for the workforce, with a focus on vocational training and industry partnerships. Cluster 3 underscores the importance of integrating new trends, technologies, and methodologies to prepare students for future challenges, including sustainability and digital transformation. Cluster 4 reflects a significant interest in incorporating AI and machine learning, equipping students with data analysis and predictive modeling skills.





universities or colleges, including its influence on educators. This is evident from the branch of AI technology leading to the first cluster, or the red cluster. For example, discussions within the red cluster highlight findings that AI, alongside social media assistance, can positively impact students' academic performance and mental well-being [9]. Other studies also indicate similar outcomes but note deviations caused by some students, including the use of AI like ChatGPT, which can influence educational outcomes [10]. On the other hand, discussions regarding AI's role in academic and economic transformation have received less attention, presenting an opportunity for further exploration. Additionally, the relationship between AI and integration, particularly in integrating IoT-based teaching methods with Machine Learning, is deemed essential for future analysis [11].

From the analysis, it is apparent that there is a significant gap in the literature regarding AI's role in educational transformation. Closing this gap is crucial not only from an academic perspective but also for fostering insights into how AI can facilitate sustainable and innovative teaching practices, particularly within economics education.

#### **4. Conclusion**

This study provides an overview of the main themes related to economics education AI that have been researched in recent years. The trend is a sustainable growth of publications annually related to economics education AI, which indicates that this theme has been gaining momentum of interest. The United States and The People's Republic of China currently stand out as the countries with the most publications on the theme about AI. Form the country's collaboration also showed that China and the United States have strong collaboration network. The words tree map also shows that artificial intelligence and economics where became the most used terms from overall documents.

Artificial intelligence technology is linked to another cluster theme of research such as transformation, integration, and basis. It showed that AI is already a reality and their future is promising. Several studies have been conducted to analyze AI and its association with other disciplines. There is still limited research that connects AI and education, especially in economics, econometrics, and finance but research that includes the term "students" still dominates the field. Further research about AI technology in economics education needs to be improved. Therefore, it is necessary to intensify research and development efforts to overcome technological and economic education challenges related to artificial intelligence. The other potential limitations in this study could include biases in the literature selection, as using a single database like Scopus may omit relevant studies not indexed there, potentially skewing the results. Another limitation might be over-reliance on citation counts, which can favor older, well-cited works over recent, potentially more relevant research. To address these biases, expanding the search to multiple databases, applying more refined criteria for literature selection, and combining qualitative analysis with bibliometrics can provide a more balanced and comprehensive understanding.

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Abbreviations

AI Artificial Intelligence

## References

1. Rana, A., Reddy, A., Shrivastava, A., Verma, D., Ansari, M. S., & Singh, D.: Secure and Smart Healthcare System using IoT and Deep Learning Models. In: 2022 2nd International Conference on Technological Advancements in Computational Sciences (ICTACS). (2022).
2. Harry, A.: Role of AI in Education. *Interdisciplinary Journal and Hummanity*, 2(3), 260–268 (2023).
3. Shrivastava, A., Prasad, S. J. S., Yeruva, A. R., Mani, P., Nagpal, P., & Chaturvedi, A.: IoT Based RFID Attendance Monitoring System of Students using Arduino ESP8266 & Adafruit.io on Defined Area. *Cybernetics and Systems*, 1–12 (2023).
4. Pritchard, A.: Statistical bibliography or bibliometrics. *Journal of Documentation*, 25(4), 348–349 (1969).
5. Ahmed, S., Alshater, M., Ammari, A. E., & Hammami, H.: Artificial intelligence and machine learning in finance: A bibliometric review. *International Business and Finance*, 61(2022).
6. Alshater, M. M., Hassan, M. K., Khan, A., & Saba, I.: Influential and intellectual structure of Islamic finance: a bibliometric review. *International Journal of Islamic and Middle Eastern Finance and Management* 14(2), 339–365 (2020).
7. Baker, H. K., Kumar, S., & Pattnaik, D.: Fifty years of The Financial Review: A bibliometric overview. *The Financial Review/the Financial Review* 55(1), 7–24 (2020).
8. Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D.: Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clus-

- ters from bibliometric analysis. *Journal of Behavioural and Experimental Finance*, 32 (2021).
9. Shahzad, M. F., Xu, S., Lim, W. M., Yang, X., & Khan, Q. R. Artificial intelligence and social media on academic performance and mental well-being: Student perceptions of positive impact in the age of smart learning. *Heliyon*, 10(8), (2024).
  10. Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B.: What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, 10(1), (2023).
  11. Baskar, G., Nashath Omer, S., Saravanan, P., Rajeshkannan, R., Saravanan, V., Rajasimman, M., & Shanmugam, V.: Status and future trends in wastewater management strategies using artificial intelligence and machine learning techniques, (2024).

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