Artificial Intelligence in Education: Snapshot Trends and Insights from Bibliometric Analysis

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ABSTRACT

Artificial Intelligence (AI), coined by John McCarthy in 1956, has significantly influenced various sectors, including education, which has leveraged computing technologies since the mid-1900s. This study conducts a bibliometric analysis of AI in education using Scopus data from 1986 to 2022, identifying 167 relevant publications out of over 4,000 AI-related works. Research trends reveal three phases: minimal growth (1980s–early 2000s), moderate growth (mid-2000s–2018), and exponential growth (2019–2022), driven by pandemic-induced educational challenges. Computer Science dominated the subject area (36%), followed by Engineering (18%) and Social Sciences/Mathematics (10%). Geographically, China led with 20% of publications, followed by the USA (9.6%) and Indonesia (6%), while Malaysia ranked fifth (4%). Co-authorship analysis highlighted strong international collaborations, with China having the most associations and the USA the strongest link strength. The United Kingdom achieved the highest citation count (387). Keyword co-occurrence analysis identified 17 significant terms, grouped into four clusters, reflecting diverse research themes. Despite progress, the low publication count (167) indicates substantial untapped potential, particularly in cross-disciplinary applications. China's leadership suggests opportunities for global collaboration to advance research. Future studies could explore AI's role in areas like ethical education, socio-emotional learning, and multicultural education. This analysis provides a snapshot of AI in education research, highlighting trends, gaps, and opportunities for innovation in this evolving field.

Keywords: Artificial Intelligent, Education Technology, Bibliometric Analysis, Research Trends, Cross disciplinary Collaboration

INTRODUCTION

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. Artificial Intelligence (AI) term was coined by John McCarthy in 1956 during the Dartmouth Conference. Since then, numerous researchers, scientists, and innovators have contributed to the advancement and popularization of Artificial Intelligence in almost all aspect of human life. Likewise, education sector has been leveraging on the advancement of computer technology since mid-1900s. The developments in computers and related computing technologies saw the use of computers in different parts of the education sector, such as the development of computer aided instruction and learning in classroom interactions.

Later developments in computers and computer-related technologies, including networking, the internet, the world wide web, and increased processing, computing, and other capabilities, including different programs and software packages that are task oriented, have seen the increased application of computers in different ways in the education sector. Computer and information communication technologies have over the years continued to evolve, leading to the development of artificial intelligence. Artificial intelligence, according to Coppin, is the ability of machines to adapt to new situations, deal with emerging situations, solve problems, answer questions, device plans, and perform various other functions that require some level of intelligence typically evident in human beings.

METHODOLOGY

To gain quick insights into patterns, trends, and relationships of AI research in education, a brief bibliometric analysis was conducted by extracting relevant publications from Scopus Elsevier from 1986 to 2022. Out of more than 4000 AI related publications in Scopus collected from various sources such as conferences, journals, book chapter etc, only 167 or about 4% publications were related to AI in education as illustrated in Figure 1.

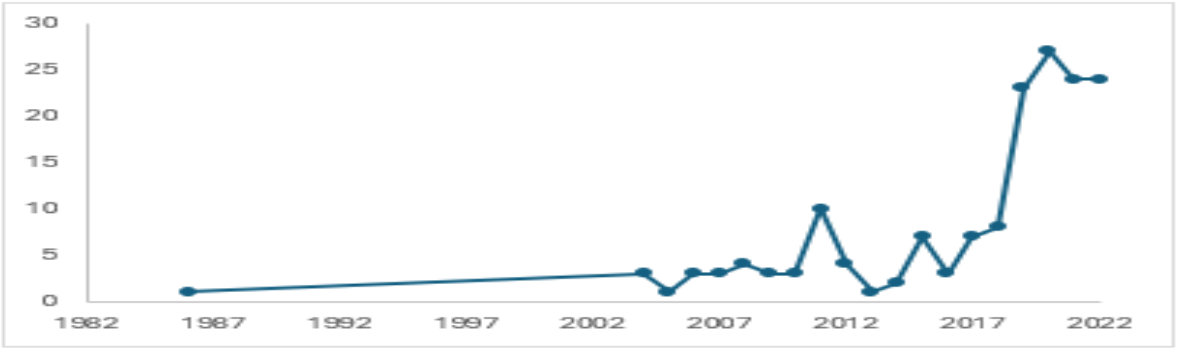

Fig. 1 Analysis of Yearly Documents Published on AI in Education from 1986 until 2022.

RESULT AND DISCUSSION

Generally, we can classify the trend into three (3) stages starting with infant stages where very small number of yearly publications observed between 1980's to early 2000 followed by moderate cyclic stage form mid 2000 until 2018. From 2019 onwards, there is exponential growth in this area which can be associated with the focus by researcher on mitigation on the education practise which was impacted by pandemic by deploying AI applications.

As far as documents by subject area analysis is concern, the current findings showed that the highest number of published documents were classified under Computer Science field (36%) followed by Engineering (18%) and 10% from Social Sciences and Mathematics respectively as shown in Figure 2.

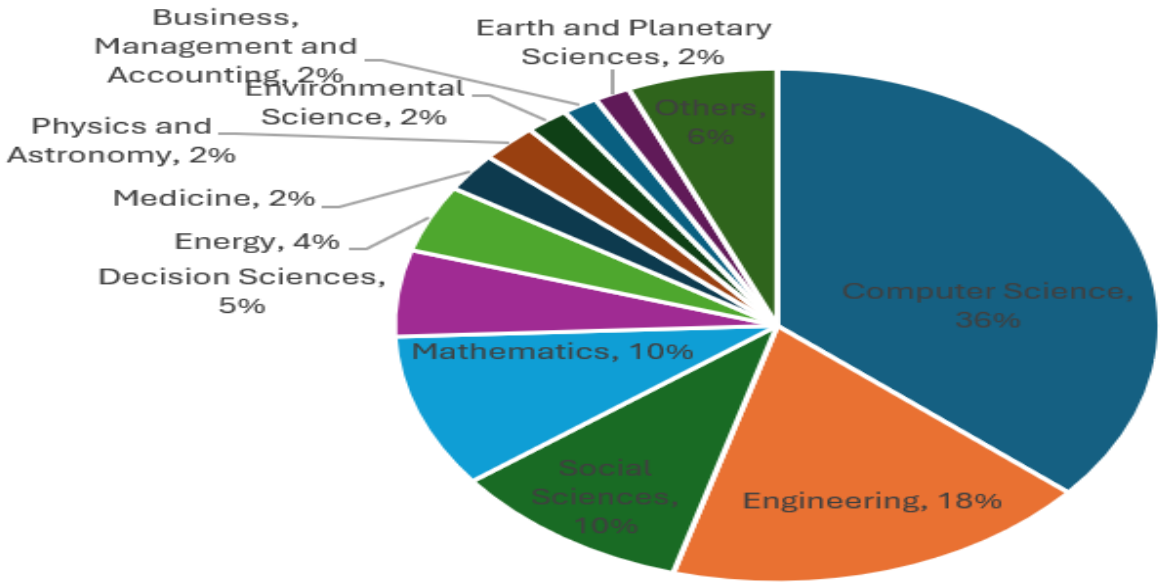

Fig. 2 Analysis of Documents by Subject Area

Figure 3 reveals world's top 10 countries leading of the research activity in this field. China at the top of the list that contribute about 20% followed by USA at 9.6 % and Indonesia at 6%. Malaysia listed at 5th places with 4% contribution.

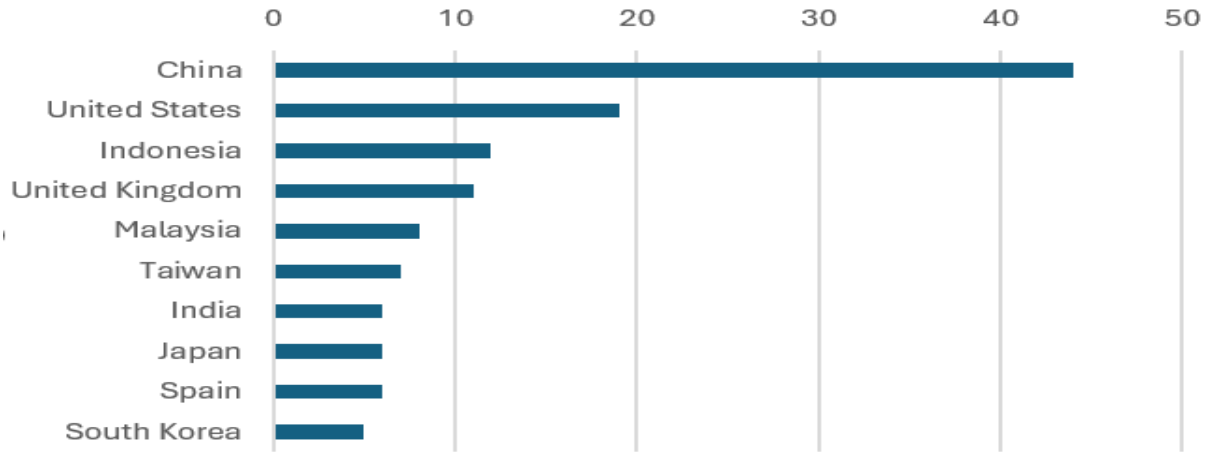

Fig. 3 Analysis of Documents by Country

It is interesting to observe that the number of publications there among top 10 affiliations are not significantly different with only one document less among top 3 (3 publications) compare to the rest in the list (2 publications form 4th – 10th position) shown in Figure 4. There is also one representative form Malaysia included in the list which is University Sains Malaysia with published two publications in total related to AI in education.

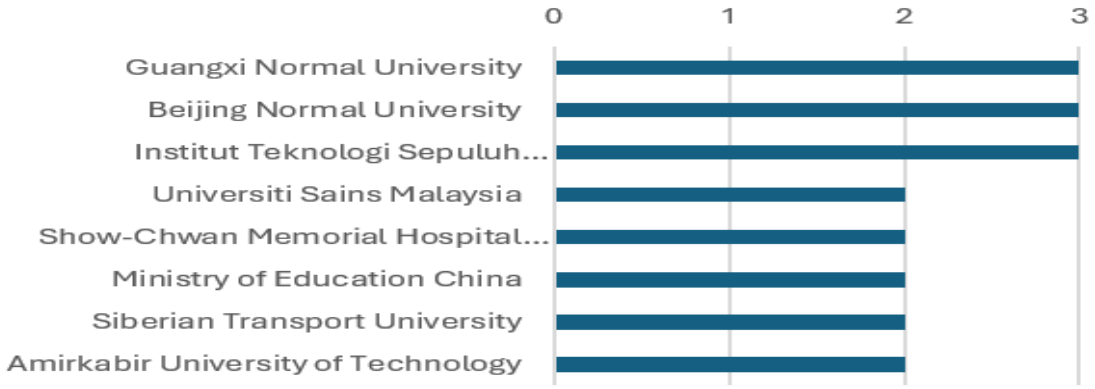

Fig. 4 Analysis of Documents by Affiliation

To have insight on co-authorship relationship among countries, VOS viewer software was used to produce the networking displayed in Figure 5. The closer the two countries are, the stronger and greater their connections. A total of 24 countries with at least 2 documents is presented. China found to have highest associations in terms of documents with 44 and the link strength of 8. Despite of lower documents number, USA has the strongest link of 11 while United Kingdom gain the highest citation with 387 in total.

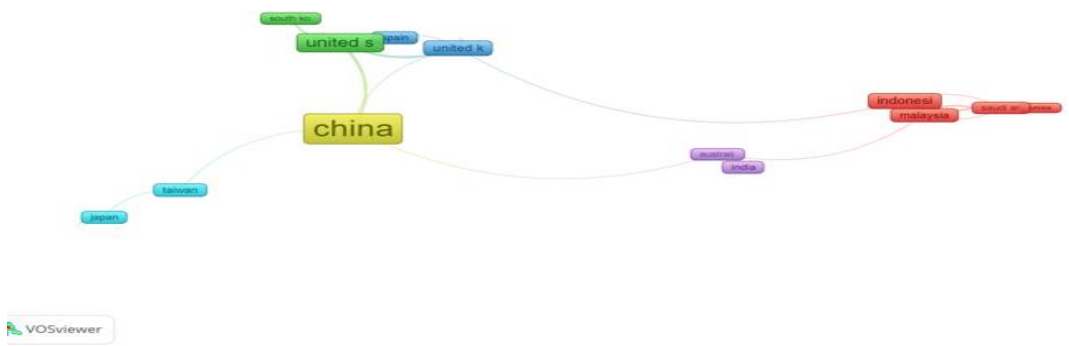

Fig. 5 Co-authorship Analysis in terms of Countries (scale is with number of documents)

When doing the co-occurance analysis, different keywords used for AI in education been considered with minimum occurrence in the keywords of all documents is set to 10. Out of 1775 keywords, only 17 met the threshold. These 17 keywords can be clustered into 4 groups of different colours presented in Figure 6.

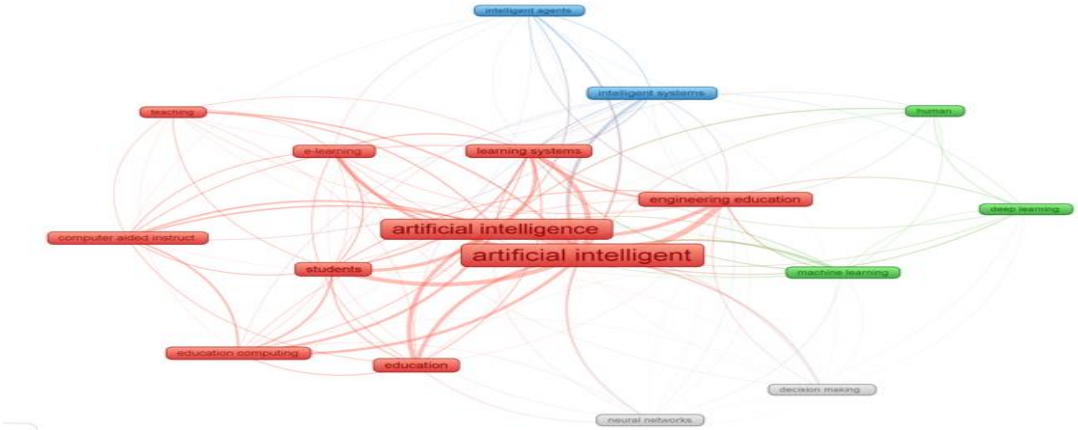

Fig. 6 Co-occurrence Analysis of All Keywords

CONCLUSION

In conclusion, this brief bibliometric survey on AI in education extracted from Scopus database provide a better understanding of the general trend of research in this area. A relatively small total number of 167 documents obtained from the "Artificial Intelligent" AND Education keyword search is the evident that there is huge opportunity to explore in this area. There is also a big gap between subject area of Computer Sciences to the other subject means the cross-discipline research is rather yet to fully executed. Since Because China is now in the lead when it comes to research in this field, it would be beneficial for other countries to interact and engage with China in order to advance their research capabilities in this demanding area. While quite number of keywords may have been explored to some extent by now, there is still potential for further investigate and apply AI techniques to enhance other aspect of education such as effective assessment, ethical education, socio-emotional learning, multicultural education and many more to complement the whole process of teaching and learning process expected in the future.

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