

The role of Artificial Intelligence (AI) Software in education and Research: A Systematic Literature Review

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ABSTRACT

Artificial Intelligence (AI) has an important role to play in shaping the future of software development. AI responds to complex challenges in the information technology industry and expands the scope of future possibilities, which include increased automation, personalization, and security. The research aims to identify the role of AI in education and research from various aspects of software development, and evaluate the resulting implications for information technology as a whole. The research adopted the Systematic Literature Review Method following PRISMA guidelines. A total of 320 articles were collected from Scopus, Web of Science and Google Scholar and applying predefined criteria, 42 relevant articles were included for analysis. The research findings show that the role and integration of artificial intelligence (AI) has a significant impact in improving efficiency, bringing software innovation in education, learning and research in the future. AI has proven effective in personalizing learning, adapting teaching materials and improving student learning outcomes. AI accelerates the process of analyzing big data, identifying patterns and trends that conventional methods may miss. The implications of the findings suggest that the integration of AI in education and research not only improves the efficiency and effectiveness of the process, but opens up new opportunities for innovation and development of more adaptive and data-driven learning and research methods. The challenges of AI in education and research include data privacy, potential bias in algorithms, and the need for adequate technological infrastructure to support effective and secure implementation, avoid inequality of access, and ensure accurate results.

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Introduction

Artificial Intelligence (AI) is currently a key element in software development, education, and research. Artificial Intelligence in Software Engineering is the hottest trend in the rapidly evolving software world. Artificial intelligence (AI) methods and models have been widely applied to support various phases of the software development life cycle, including software testing (Amalfitano et al., 2023). AI enables automation of the coding process, real-time error detection, and improved application performance through machine learning. In education management, AI can improve the learning process and address key challenges in educational institutions, such as improving teacher efficiency, anticipating different student needs, and simplifying administrative tasks (Igbokwe, 2023). AI can provide teachers with everything they need for evaluation and performance improvement (Abdulmunem, 2023). facilitates big data analysis with high speed and accuracy, enables the discovery of new patterns and trends, natural language and machine language processing, and optimizes the research process through AI-based simulation and prediction, driving efficiency, accuracy, and innovation in this digital age.

The role of Artificial Intelligence plays an important role in improving the quality of education and Research (Perminova et al., 2023). Artificial Intelligence (AI) is rapidly evolving and plays an important role in the way we communicate, learn, and interact in society (Javed et al., 2023). In the rapidly evolving landscape of software development, Artificial Intelligence (AI) is emerging as a transformative force shaping the future path of education (Calvache, 2024). As technology continues to evolve, the integration of AI into the software development process is growing (Bull & Kharrufa, 2023). This article will explore the important role that AI plays in shaping the future of software development. By utilizing AI capabilities, it encourages the integration of AI in education and supports continuous professional development (Mouta et al., 2023).

Artificial intelligence has become a booming technology and brings many positive changes in the education process (Sarwar & Gul, 2024). AI brings a paradigm shift by offering intelligent solutions to these challenges (Dimitriadou & Lanitis, 2023). Through this process of AI-based software engineering, many studies have successfully applied learning strategies in various application fields (Alshammari, 2022). Researchers and educators need a framework to integrate AI literacy into educational and research technology literacy (Stolpe & Hallström, 2024). AI-based approaches are changing the landscape of software development and paving the way for a new era of technological innovation in education and research for sustainable development in the industrial era 4.0 (Abulibdeh et al., 2024).

The utilization of artificial intelligence technology in the field of education is a promising area for further development as it has become an essential component of modern education (Perminova et al., 2023). Moreover, the integration of AI into the software development process opens up new opportunities to address long-standing issues such as software quality assurance and security vulnerabilities. By leveraging AI, developers can analyze and recommend future research to transform higher education with AI (Chiu, 2024).

Research on the role of Artificial Intelligence (AI) software in education and research covers the analysis and development of various AI applications to improve learning and research processes. The scope of this research includes the development of adaptive learning systems that can tailor teaching materials to students' individual needs, assessment automation that reduces teachers' workload, and learning data analysis to improve educational outcomes. In the research field, the main goal is to utilize AI in big data analysis, detect hidden patterns and trends, and accelerate the scientific discovery process through AI-based simulation and prediction.

Method

This research uses the systematic literature review method. SLR is a process that enables the collection of relevant evidence regarding a specific topic that conforms to pre-defined eligibility criteria and to obtain answers to formulated research questions. The usual method has four basic steps: search (defining the search string and type of database), assessment (inclusion and exclusion of pre-defined literature, and quality assessment criteria), synthesis (extracting and categorizing data), and analysis (narrating the results) and finally reaching conclusions (Mengist et al., 2020). SLR is also used as a tool to identify knowledge gaps, limitations, and research directions collected in a database (Soledad, 2018).

This research aims to find published articles that specifically address the issue of AI in education and research by focusing on specific terms in the title, keywords and abstract, in this methodology helps to limit the scope and relevance of the articles presented in the review.

The first step in data collection is to conduct a literature search using the *Scopus*, *Web of Science* and *Google Scholar* databases. The search was conducted using keywords relevant to the research topic to identify relevant articles as in the following table 1.

Table 1 explains the keywords used by researchers to search SLR articles, and the guideline used is PRISMA as a technique or framework used in the SLR research process, which aims to systematically collect, identify and synthesize data information in SLR research. The researcher applied the data collection steps in the PRISMA structure.

Table 1. SLR keywords

Database	Keywords	Result (2020-2024)
Scopus	Integrating Artificial Intelligence" AND "Software Development" AND "Technology Education" OR "Research"	200
Google Scholar	Integrating Artificial Intelligence" AND "Software Development" AND "Technology Education" OR "Research"	100
Web of Science	Integrating Artificial Intelligence" AND "Software Development" AND "Technology Education" OR "Research"	20
Total		320

The research object was determined as scientific publications obtained from the database. These scientific publications were published in the last four years (2020-2024). Then, the articles found through the literature search were evaluated to meet the inclusion criteria set. Articles that were relevant and aligned with the research objectives were selected for further analysis that shown on Table 2.

Table 2. Inclusion and Exclusion Criteria

Inclusion	Exceptions
Research related to artificial intelligence (AI) software in the fields of education and research	Research not related to artificial intelligence (AI) software in the fields of education and research
Articles published from 2020 to 2024	Articles published beyond 2020 to 2024
Research articles published and produced in English	Research articles produced in languages other than English
Articles and research papers are openly accessible and full versions can be downloaded.	Research article not accessible online

This research follows PRISMA guidelines and utilizes databases from Scopus, Web of Science and Google Scholar. The criteria set by the researcher is the field of research that discusses the role of AI in education and software development. The selection of literature was based on the predetermined inclusion and exclusion criteria.

During data extraction and quality assessment, the researcher obtained a total of 42 articles (N=42) to be used in addressing the research problem and further analyzed to obtain findings regarding the role of artificial intelligence in education, research and software. Next, a systematic analysis of the selected articles was conducted, where relevant information about the required competencies was extracted and analyzed systematically. This involved mapping and clustering the

competencies that appear in the relevant literature. The analysis aims to gain a comprehensive understanding of the required role of AI in education, research and software development. Here is the flow diagram of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) on Figure 1:

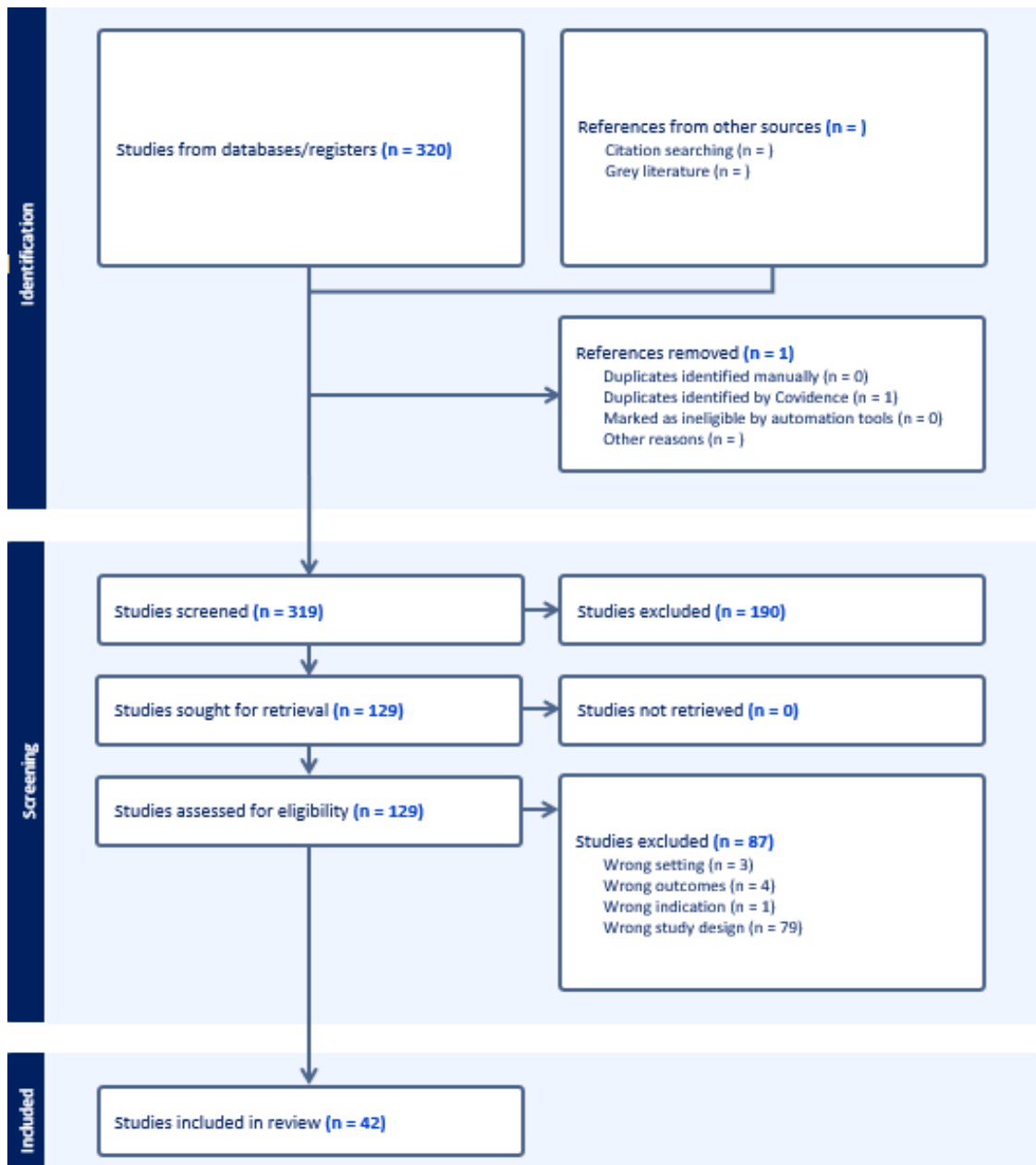


Fig 1: PRISMA Flow Diagram

The research findings are then presented in a systematic and comprehensive manner. This includes the data used in the SLR, compilation of the list of identified software, analysis of the relationship between AI and the fields of education, research and software. Through the systematic

literature review method, the researcher was able to identify, evaluate, and synthesize the literature relevant to the topic of AI in education and software. By using this method, the researcher was able to draw more accurate and reliable conclusions regarding the role and integration of artificial intelligence (AI) which has a significant impact in improving efficiency, bringing software innovation in terms of education, learning and research. SLR discussion and analysis are presented with the provisions regarding the topic of discussion regarding Figure 2: 1) year of scientific article, 2) method of scientific article, 3), 4) Journal rank analysis results, 5) Data Analysis Technique, 6) Study Location, 7) Data Collection

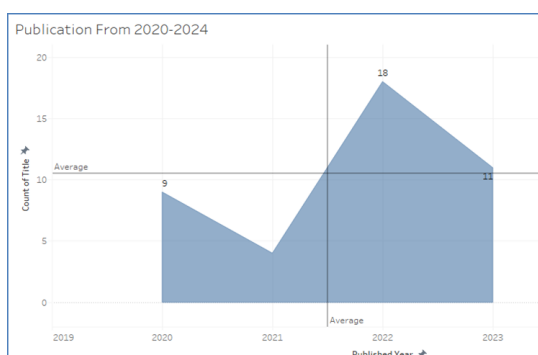


Fig 2: Diagram of the Development of Publications Related to AI

It was observed that the highest growth occurred in 2022 with 18 articles, in 2023 with 11, in 2020 with 9 articles, and in 2021 with 4 articles. Overall, the increasing number and diversity of scientific articles on AI development from 2020 to 2024 shows that AI has become one of the most important and exciting major research topics, and its role in shaping the future of technology and society cannot be ignored. Figure 3 is the method used in the journal:

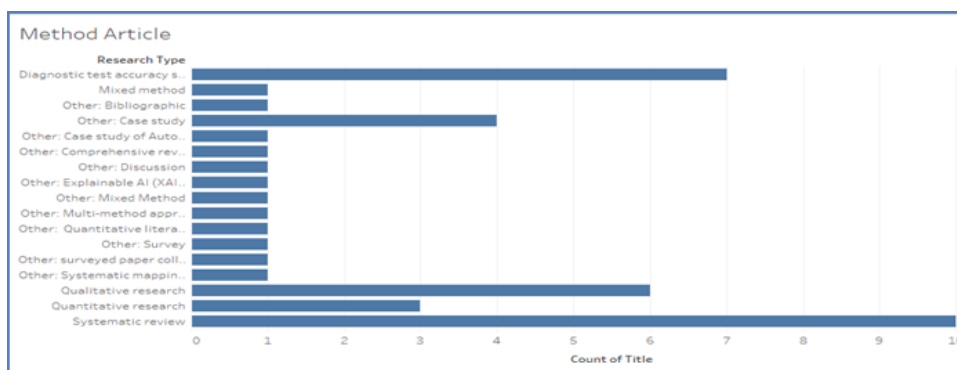


Fig 3: Research Methods in Articles

Figure 3 Analysis results regarding the research methods used in the articles. It shows that 10 articles used the Systematic review method, 7 articles used the Diagnostic test accuracy method, 6 articles used the qualitative research method, and 4 articles used the case study research method.

Based on these findings, it can be identified that Systematic review is the most commonly used in research on artificial intelligence.

Systematic review methods are often used to collect, evaluate, and synthesize evidence from existing studies on a particular topic in the field of AI. In the context of AI research, systematic reviews can be used to identify trends and patterns in the development of AI techniques, assess the effectiveness of AI applications in various domains, and evaluate the ethical and social implications of AI advances. Figure 4 Results show the Ranking analysis of Journals.

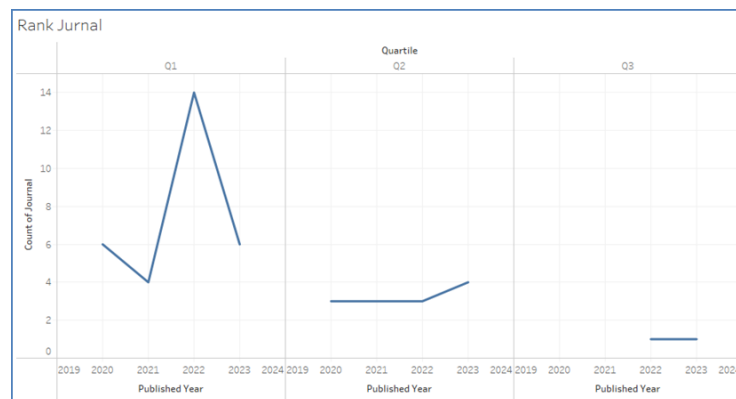


Fig 4: Rank articles related to AI

Figure 4 shows that the journal articles used are generally ranked in Quartile 1 (Q1). In research on software development that focuses on artificial intelligence (AI), it is important to refer to articles that have been published in reliable and high-quality journals. One indicator that is often used to assess the quality of a journal is the journal rank or journal quartile. Journals with a Quartile 1 (Q1) ranking are the top journals in their field, indicating that the articles published in these journals are of very high quality and relevant.

Thus, in conducting a literature review study on software development using AI, it is important to select articles published in journals with a Quartile 1 ranking as the main reference source. In this way, researchers can ensure that their research is related to the latest developments and most important findings in the field of AI-based software development, as well as make a significant contribution to the academic literature and industrial practice in the field. Figure 5 shows the data analysis techniques used in AI articles.

Figure 5 shows that the data analysis methods often used in AI research are case studies, discussions, and literature reviews. Case studies allow researchers to dig deeply into how AI-based software has been implemented in educational settings, as well as its impact on the learning process and student learning outcomes.

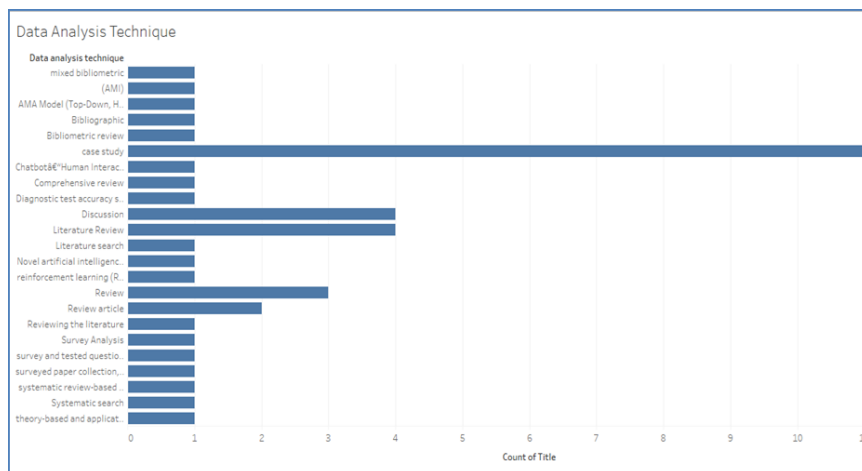


Fig 5: Data Analysis Technique used in Literature Articles

Figure 6 shows that in the global landscape of the development of artificial intelligence (AI) and related software, countries such as China, India, and Spain have played an important role in producing scholarly articles that contribute to knowledge and innovation in this field. AI articles originating from China often take center stage in academic and industry literature due to the technical excellence and innovation it offers. The following figure shows the most common AI data collection techniques used in the field of education and research.

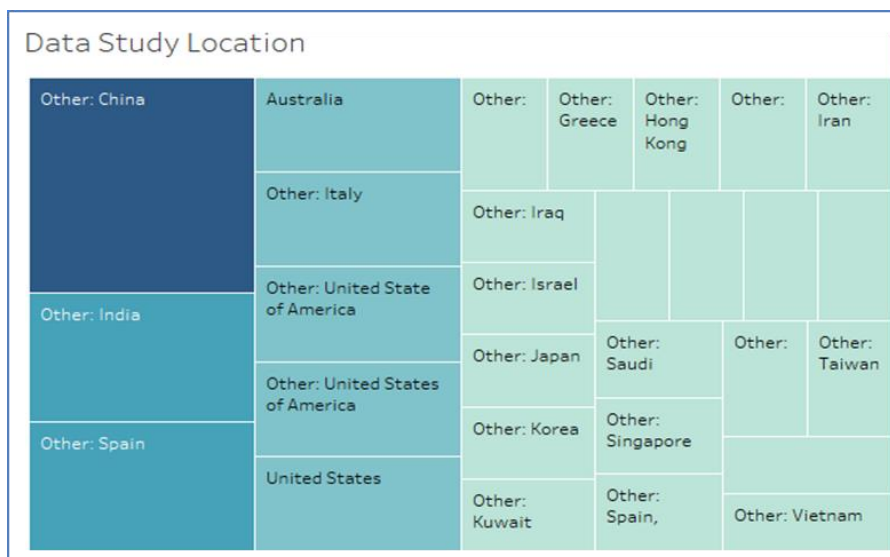


Fig 6: Study Location used in Literature Articles

Figure 7 shows that one of the most widely used data collection types in AI articles on software development is AI Software. The use of AI Software as a source of data collection is a very relevant and useful option in the context of AI-based software development. AI Software provides access to various types of relevant data, including historical data, real-time data, and data generated

automatically by the AI system itself.

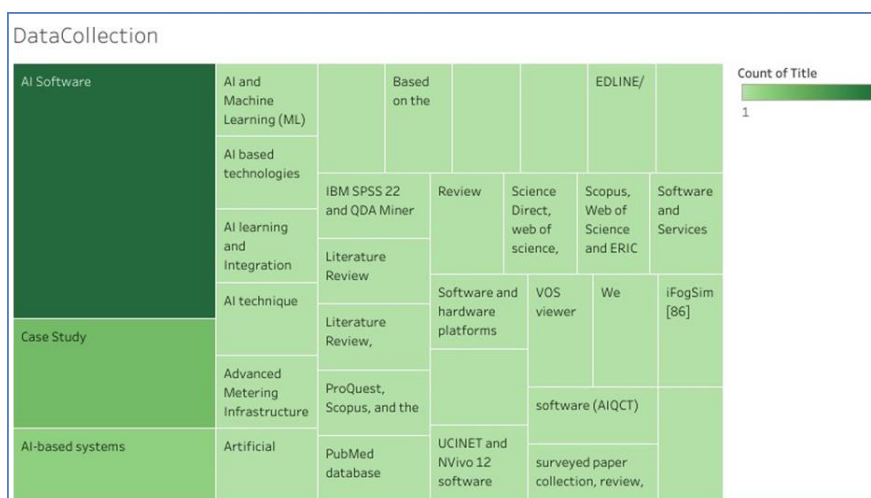


Fig 7: Data Collection used in Literature Articles

Artificial intelligence (AI) methods and models have been widely applied to support various phases of the software development life cycle, including software testing (ST) (Amalfitano et al., 2023). In addition, the use of AI Software as a source of data collection also allows researchers to access advanced AI technologies for data analysis and processing, such as pattern recognition, classification, and prediction, which can assist them in obtaining valuable information from the collected data.

Result and Discussion

The results of the literature search will be displayed relevant to the research questions posed. The researchers systematically organized and explained their findings based on themes and concepts that emerged from the analysis. In addition, the researchers carefully evaluated the sources of information identified to ensure the veracity and reliability of the results presented.

Artificial Intelligence (AI) plays an important role in transforming education, personalizing the learning experience, and improving student outcomes. AI platforms such as ChatGPT and Quillbot help students with writing, research, and problem-solving, making the learning process more efficient and interactive. AI also enables the development of intelligent tutors and guidance systems that customize subject matter according to individual needs, thereby improving engagement and learning outcomes. The technology also supports higher education by predicting and optimizing students' academic performance, as well as assisting in the comprehension of complex material.

Table 3. The role and impact of artificial intelligence in education and research

<i>Article category</i> <i>discovery</i>	<i>The role and impact of Artificial Intelligence</i>
The role and impact of Artificial Intelligence in education	<p>AI plays a role in supporting teaching, learning, and research, improving students' critical thinking and problem-solving skills, but raises concerns about plagiarism and creativity in writing (Emenike, n.d.). AI also enhances language learning through chatbots that simulate human conversations, offer personalized learning experiences, and assist future educators in language acquisition (Belda-Medina & Calvo-Ferrer, 2022). AI plays a role in improving learning outcomes and personalized educational experiences. AI automates administrative and research tasks, optimizes workflows, and identifies trends to efficiently improve educational strategies (Mijwil, n.d.).</p> <p>AI supports education with learning experiences, improves teaching, and efficiently analyzes data for research, automates processes, and accelerates data analysis (Martínez-Fernández, n.d.). AI tools such as ChatGPT provide accurate academic responses (Alafnan, n.d.). AI also improves research efficiency with extensive data analysis, integrated in the software architecture (Fathy & Saleh, 2022).</p> <p>AI enhances training with automated interfaces and explainable AI (XAI) features. In education, AI extends intelligent guidance to personalized instruction using AI in education (AIED) (Fiok et al., 2022). AI chatbots also enhance interactive learning with the help of personalization, instant feedback, and cognitive support (Mageira et al., 2022). They reinforce teaching, guide students, and support educational data analysis.</p> <p>AI systems in education utilize machine learning algorithms for prediction and classification (Bogina et al., 2022). However, the complexity of ML algorithms can lead to discrimination. AI also improves the prediction of student performance in educational institutions, with Support Vector Machine (SVM) algorithms (Rastrollo-Guerrero et al., 2020). AI automates processes, handles data, and improves academic outcomes. Artificial Intelligence (AI) tools using Large Language Models (LLMs) such as ChatGPT are also used by students to improve Automatic Writing Evaluation (AWE) (Perkins, 2023).</p>
The role and impact of Artificial Intelligence in research	<p>AI design research is human-centered for well-being, incorporating rationalistic, humanistic, and judicial perspectives. The importance of examining social and ethical impacts in AI, requires a pan-disciplinary approach (Auernhammer, 2020). AI improves the accuracy of medical research, automates tasks, and personalizes learning experiences, improving efficiency and educational tools (Handa et al., 2022). AI improves attendance monitoring in education and automates data analysis and processing tasks in research.</p> <p>AI improves research efficiency with intelligent analysis of big data. Technologies such as iFogSIM are used in evaluations, while large cloud providers offer AI services such as Google's Dialogflow and AiaaS (Janbi et al., 2020). AI also identified the effects of entrepreneurial orientation and big data analytics powered by artificial intelligence (BDA-AI) on operational performance (Dubey, R. Gunasekavan, A. Childe, S. Roubaud, D. Foroapon, C. Bryde, DJ. Giannakis, M. Hazen, 2019). Entrepreneurial traits are important to capture market changes. Challenges address the combined effects of EO and BDA-AI on performance, with limited understanding of the impact of technology on operations.</p> <p>AI is also in the research of improving production flexibility and efficiency through intelligent decision-making and dynamic reconfiguration. Intelligent manufacturing services include data visualization, system maintenance, and prediction (Wan, n.d.). Prototyping platforms and end-to-end communication optimize resources, accelerating global manufacturing with collective and autonomous intelligence.</p>

In the research field, AI has improved efficiency and accuracy by analyzing big data intelligently and quickly. Software such as VOSViewer and NVivo 12 are used for bibliographic and trend analysis, helping researchers find patterns and relationships in vast data. AI also enables early disease prediction and risk assessment in medical research, and facilitates the development of new technologies such as Digital Twins in smart manufacturing. While AI offers many benefits, such as data-driven decision-making and improved sustainability, challenges such as data integration,

security, and ethics still need to be overcome to maximize its potential in research.

RQ2. How the role of AI software/tools can be applied in education and research.

Table 4. The role of AI Software in education and research

	The role of AI Software in education and research
Integration	AI-driven Digital Twins (DT) Technology Software enhances smart manufacturing and advanced robotics (Huang et al., 2021). The benefits of DT include operational efficiency and failure prediction, but challenges include data integration and security. Future prospects promise increased adaptation and innovation in the industry.
Agents (AMA)	Artificial Moral Agents (AMA) are AI software designed to bring ethical and moral aspects to AI decision making (Cervantes et al., 2020). In the context of education and research, AMA can help in ensuring that the use of AI is done by considering the ethical implications of the decisions taken by the AI system.
Software	Examus' AI software analyzes student behavior during online lectures. AI monitors students, raising concerns about privacy and ethics. ProctorU uses AI modules to monitor students during exams. AI affects education by introducing new technologies for online learning.
Quillbot	ChatGPT and Quillbot are AI application platforms that are often used by students as mediation and prediction of 21st century job skills (Segbenya et al., 2021).
Software	Xproctor AI software authenticates students through facial recognition and behavior monitoring (Nigam et al., 2021).
Learning (ML)	Abstract interpretation, DeepZ, DeepPoly, K-relu, RefineZono are AI software used as Machine Learning (ML) (Krichen et al., 2022).
Simulation software	iFogSim AI is one of the software that enables simulation of edge and fog computing systems with artificial intelligence that models and evaluates the provision of Distributed AI as a Service (DAaaS) (Janbi et al., 2020).
Use (WoS)	found that research in the AIED field entered a stage of rapid development around 2012, and the numbers are still growing.
Software	UCINET is software used for the analysis of social networks and other complex networks. In the context of education and research, UCINET allows researchers to understand the structure and dynamics of relationships between individuals or entities in a particular educational or research context (Cioffi et al., 2022).
Software	NVivo 12 software is software used for qualitative analysis of data, including text, audio, video, and other non-structured data. In research, NVivo 12 allows researchers to explore and understand patterns in qualitative data, which can provide valuable insights in educational and research contexts.
Services Companies and (FICCI)	The entrepreneurial orientation allows companies to enhance their performance by improving their decision-making ability through exploiting BDA-AI.
Intelligence/Machine Learning	conclude that the essential elements of an educational program include a wide variety of disciplines, hence the need to involve instructors with a background in legal, social and ethical issues.
Intelligent Networking (XAI)	integrates deep-learning AI models deployed at the edge with the SDN paradigm to support multimedia traffic constraints and introduces trust into human-AI interactions (Fiok et al., 2022). Our study reviews the important capabilities, limitations, and desirability of XAI tools developed over the past few years and reviews the history of and AI in education (AIED).
Methodology of science, Holistic Learning (ML)	The ELT-PSO model based on the data set is the most accurate, with R2 of 0.99 and RMSE of 2.33 as compared to the other seven models.
and QDA	Artificial intelligence (AI) and machine learning (ML) are revolutionizing many fields of study, such as visual recognition, natural language processing, autonomous vehicles, and prediction. The traditional von-Neumann computing architecture with separate processing elements and memory devices has improved its computing performance rapidly along with the scaling of process technology (Kim et al., 2022).
Software	The use of AI in language learning is on the rise and chatbots are a great
an Interaction Model (CHISM)	VOSViewer software is used to study AI and ML trends in energy (Entezari et al., 2023). Learning modules on Artificial Intelligence and language learning were designed specifically for this research, including an ad hoc model called Chatbot-H Interaction Satisfaction Model (CHISM), which was used by prospective teachers to evaluate linguistic and technological features (Belda-Medina & Calvo-F 2022).
ge Model (LLM)	In the field of education, the academic integrity of students' use of Artificial Intelligence (AI) tools using Large Language Models (LLMs) such as ChatGPT in formal assessments is growing (Perkins, 2023).
hardware platforms	Edge AI serves as a distributed neural network to imbue connected intelligence in 6G, thereby enabling intelligent and seamless interactions among the human world, physical world, and digital world.
Medical Things (IoMT)	The Internet of Medical Things (IoMT) is emerging as a next-generation bioanalytical tool that combines network-connected biomedical devices with soft applications to improve human health (Manickam et al., 2022). AI involves various subsets, including machine learning (ML), deep learning (DL), conventional neural networks, fuzzy logic, and speech recognition, with unique capabilities and functions that can improve the performance of modern medical science.

Artificial Intelligence (AI) software has become the backbone in the transformation of education and research, bringing significant advancements in the way we learn, teach and conduct research. Some of the AI software that has proven to have a significant influence and role in this field include iFogSim AI, Artificial Moral Agents (AMA), UCINET, NVivo 12 software, AI Machine, AI learning algorithms, Explainable AI (XAI), and various AI-based technologies.

AI has changed the education and research landscape by enabling deeper analysis, more accurate predictions, and smarter decision-making. Through this AI software, educational researchers and practitioners can optimize the learning process, conduct more efficient research, and better achieve educational and research goals. Thus, Artificial Intelligence software has become an integral part of developments and innovations in the field of education and research, opening the door for further advancements in the future.

AI has the potential to significantly change the IT industry, affecting aspects ranging from the way of working to the skill requirements needed. First, AI can automate many routine and repetitive

tasks, such as system maintenance, database management, and technical troubleshooting. This automation not only increases efficiency but also allows IT professionals to focus on more complex and strategic tasks, such as developing new technologies and improving cybersecurity. However, with increased automation, there are concerns that some jobs may become obsolete. Jobs that focus on routine tasks may decrease, while demand for positions that require a deep understanding of AI, data analysis, and advanced problem-solving capabilities will increase.

The impact of AI on skills requirements is also significant. IT professionals will need to develop new skills relevant to AI, such as programming in languages used for AI development (e.g. Python), an understanding of machine learning algorithms, and the ability to work with AI tools and platforms. Continuous training and lifelong learning are important to stay relevant in this fast-changing job market. In addition, the application of AI also raises serious ethical considerations.

Issues such as data privacy, bias in AI algorithms, and automated decisions that can affect human lives need to be addressed carefully. The IT industry should develop ethical and regulatory guidelines to ensure that AI technologies are used responsibly and fairly, maintaining trust and integrity in the use of these technologies.

Discussion

The use of AI in software engineering brings many significant benefits, including increased efficiency and automation. AI can automate various routine tasks such as coding, testing, and software maintenance, allowing developers to focus on the more creative and complex aspects of the project. For example, AI tools can detect and fix bugs faster than traditional methods, improving the reliability and quality of the final product. In addition, AI supports more in-depth data analysis, helping developers better understand usage patterns and user needs, which in turn can improve user experience.

However, the application of AI in software engineering also faces various challenges. One of them is the need for high-quality data to train AI models, which can be difficult to obtain and require great effort for data processing and cleaning. In addition, reliance on AI can reduce human involvement, leading to the risk of losing critical skills among developers. Data privacy and security issues are also a major concern, as the use of AI often involves processing sensitive data.

The role of AI in education and software development has the potential to create research gaps, but it also opens up promising future directions. On the one hand, the use of AI can accelerate and improve the quality of research with more sophisticated data analysis and automation of previously time-consuming processes, allowing researchers to explore broader and more complex areas. On

the other hand, reliance on AI can widen the gap between institutions or individuals who have access to these advanced technologies and those who do not, creating disparities in research and development outcomes. For the future, collaborative efforts are needed to ensure wider access to AI tools, as well as the development of relevant skills for all stakeholders. In addition, further research is needed to address ethical and technical challenges, ensuring that AI is used fairly and responsibly. With the right approach, AI can become a key driver of innovation in education and software development, opening up new opportunities and enriching knowledge in a variety of fields.

Conclusion

In conclusion, Artificial Intelligence (AI) software has proven its pivotal role in changing the paradigm of education and research across the board. From personalized learning to sophisticated data analysis, AI has brought significant advancements in both these domains. In education, AI has opened the door for more adaptive and individualized learning. Its ability to analyze student learning patterns and provide customized learning recommendations has changed the way we view the education process. This not only helps improve student achievement, but also increases their motivation and interest in learning.

On the research side, AI has become an invaluable tool in data analysis, natural language processing, and data-driven prediction. With artificial intelligence, researchers can explore data on a larger scale, discover previously undetected patterns, and make more accurate predictions. This has led to new discoveries and significant scientific advancements in various fields. However, despite its importance, challenges have also emerged with the use of AI in education and research. Data privacy, fairness, and ethics are issues that need to be addressed as we continue to develop and apply AI technologies in these two domains. It is important that we ensure that the use of AI in education and research is done with its ethical and social implications in mind. Thus, the main conclusion is that Artificial Intelligence software has brought significant and positive impact to education and research. By continuing to develop this technology wisely, we can harness its full potential to create a more inclusive, innovative and efficient world of education and research.

Future research into the use of artificial intelligence (AI) in education and software engineering will be critical to unlocking the full potential of this technology. This research needs to focus on the ways AI can personalize learning experiences, improve teaching efficiency, and optimize software development. In addition, further studies are needed to address the ethical challenges and biases that arise from the use of AI, ensuring that these technologies are applied fairly and responsibly. Future research should also explore how AI can support collaboration between disciplines, enabling

better knowledge integration and driving innovation. By understanding and addressing the challenges and capitalizing on the opportunities that AI offers, the future of education and software engineering can become more inclusive, effective and innovative.

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