



ORIGINAL CONTRIBUTION

The Impact of Artificial Intelligence (AI) and Robotics on Higher Education

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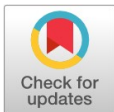
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Abstract— Long-term, Artificial Intelligence (AI) and robotics may have an outsized effect on universities. Understanding the full scope of this impact is complicated by the siloed nature of the relevant literature and the fluidity of key notions. This present study is intended to understand how and to AI can facilitate the higher education sector. Design fiction that vividly imagines scenarios of future use of artificial intelligence or robotics offers a way to explain and question the possibilities of technology. This paper details how we used a narrative literature review to create eight design fictions that illustrate the breadth of opportunities for AI and robots in education, administration, and investigation. They generate larger conversations by highlighting how they might teach higher-level skills, shift employee responsibilities, and address consequences for human agency and digitalization. The current study's findings outline the 8 fictions to outline the comprehensive understanding of the uses of IA in the academic sector of higher education. The narrative literature is reviewed extensively, emphasizing the social, ethical, pedagogical, and administrative concerns of automating via AI and robots in HE. Readers interested in challenging assumptions about the future are encouraged to go "in the other way" and approach the book. One possible explanation for their fictional status is this.

Index Terms— Artificial intelligence, AI, Robots, Social robots, Learning analytics, big data, AIED, Design fiction

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Introduction

Artificial Intelligence (AI) is more than just a new technology but rather a concept or desire for how computers may be engaged in human decision-making, making it difficult to appreciate the potential influence of AI and robots on HE. People's ideas on achieving this and the foundations of education changed as new tools became available (Roll & Wylie, 2016). While AI and robots are concepts studied for decades, certain implementations are advanced and already making an impression. The same applies to possible applications, many still in the conceptualization stage. From a time standpoint, it is unclear when the employment of AI and robots in HE began or will end.

Since AI is being put to greater use in the classroom, the education landscape is shifting rapidly. Compared to the natural intelligence shown by humans and other biological species, AI may be described as "machine intelligence demonstrated by non-biological things" (Leahy et al., 2019, p. 6). Applied artificial intelligence (AAI) in education (AIED) is a newer subject that has trailed behind others, like AI in applied science and AI in finance (Luckin & Cukurova, 2019; Chen et al., 2020a). Although falling behind, Chen et al. (2020a) show that AIED research continues to attract attention and may have good consequences Winkler-Schwartz et al., (2019), learning analytics (Shum & Luckin, 2019), and simulation-based learning (Dai et al., 2019), are just a few of the emerging applications of AIED being used in

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today's classrooms. Simulation has been highly suggested and employed in these AI-based educational applications to provide dynamic and flexible teaching and learning environments (Tongo et al., 2017; Johnson & Lester, 2016; Chen et al., 2020b).

Problem Statement

The recent trends worldwide indicate that AI significantly influences every domain of society, and education is no exception. However, the literature cannot document the impact of AI on possible venues in the education sector. Several works of fiction may be used to provoke contemplation on the future. Narrative scenarios, which are fictional, are used in strategic planning and future studies to capture contrasting potential futures. A positive aspect of fictitious settings is that they promote introspection apart from the pressures of creating anything useful. The present study intends to evaluate the possible design fiction and their impact on the HE system.

The Objective of the Study

To explore the impact of Artificial Intelligence (AI) and Robotics on higher education.

Research Question

How do Artificial Intelligence (AI) and Robotics impact higher education?

Significance of study

Public, governmental, and academic interest in AI and robotics has skyrocketed in recent years due to their potential to revolutionize our future (Ng et al., 2022). Higher education (HE) is not immune, and the effects may be just as severe as in other spheres of life (DeMartini & Benussi, 2017; Bates et al., 2020). HE will need to change how he teaches so that his students are prepared for the new economy and, maybe, a new way of life. Artificial intelligence and robots also have the potential to alter the structure and operation of educational institutions, including but not limited to how students are taught and how professors do their research. However, there are a variety of obstacles that make it hard to decipher the causes of HE's shift. The influence is "wide and profound," as Clay (2018) puts it, but the research literature analyzing it is fragmented, which is a contributing factor. Examples of distinct literature in this area are AI and robots for instruction.

Similarly, educational data mining, LA, and AI for education all exist as distinct subfields. Other than learning, such as robotics science concepts or text and data mining (TDM), applications to ES inquiry are also typically studied independently. As a result, we need to take a broader perspective of this varied literature to comprehend the possible effects of AI and robots in HE.

Literature Review

Background

Programs to teach college students and working adults about AI have become a priority for many nations. This has led to the publication and dissemination of AI strategies in countries such as the United States (National Artificial Intelligence Initiative Office; NAIIO; 2021), China (Ministry of Education of the People's Republic of China; 2019), and Germany (Federal Ministry of Education and Research; BMBF; 2021). AI Elements (<https://www.elementsofai.com/>) in Finland is a government-backed pilot initiative to improve the general public's understanding of AI.

In addition, several initiatives over the last few years have sought to expose AI to university students. Programs like these are designed with students who do not come from a computer science or IT background in mind, whether that be in the medical field (Brouillette, 2019; Aulenkamp et al., 2021; Charow et al., 2021; Chaiyakot et al., 2022) or business (Vazhayil et al., 2019; Xu & Babaian, 2021). As said above, educating AI specialists is crucial, but so is teaching those who are "non-experts" to work with or alongside AI (Ng et al., 2021a). Consequently, the emphasis of AI literacy education should be on learning about AI and thinking critically about the effects of AI. Learning goals for AI literacy only sometimes include, nor do they need, a background in computer programming or other forms of computer literacy (Long & Magerko, 2020).

Despite its complexity, this topic deserves more attention and debate because of the many educational, practical, ethical, and social justice concerns that AI and robots raise. The education literature has several articles discussing the difficulties of introducing new technology as a change management issue (e.g., Reid, 2014). There will be obstacles and ironies along the path toward the widespread use of AI and robotics. Critical reactions to technology have a long history in academic writing. Common topics include concerns that tools like computers might make education less personal. Fear of commercialization or neoliberal ideology cloaked in technology is frequently

what drives them. Both AI and robotics have sparked heated discussions, and are still waiting for a clear answer. Digitization in higher education has been the target of some pointed criticism. Hence, we need to ask what we ought to do with AI and robots and what we can achieve with them (Selwyn, 2019a; Shahbaz et al., 2016). However, a recent literature review claims that informatics dominates the field of AI learning to the exclusion of pedagogy and ethics (Zawacki-Richter et al., 2019). Research on AIED has long been criticized for what some call its "ALIEN" (American, Liberal, Industrialized, Democratic) slant (Blanchard, 2015).

Role of Robots and Robotics in HE

Robots

A robot is an insidious and powerful invention. The robot is driven using controls reminiscent of a car. Robots are designed to aid humans in their daily activities. The robot may be instructed to pick up items, transport them, destroy them, or alter them in some way. Similarly, AI robots facilitate HE in library management, exam settings, and teaching (Okunlaya et al., 2022).

Origins and Development of Robotics

A robotic manipulator is an arm and gripper attached to a machine that may be operated remotely. The remote manipulator is controlled by a person using a control device. The telemanipulator's primary function is to facilitate productive collaboration with radioactive substances. Machines may be accurately controlled with the help of numerical control. Mass. Institute of Technology pioneered the application of numerical control in 1952. The invention of APT was made possible by CNC (Automated Programming Tool). The first commercially available industrial robot used these innovations in 1961. Industrial settings, like automobile assembly lines, are common places to see these robots at work. Autonomous robots have been developed in response to the need for driverless vehicles. Since 1975, researchers have been attempting to create a functional humanoid robot. A humanoid robot known as "Cog" has been under development at the MIT Artificial Intelligence Laboratory since 1994. In the future, robots will be man's greatest ally. Nevertheless, programmable machines that assume the form of characters will soon dominate.

Robot Operating System

Robot OS (operating system) is a one-of-a-kind, full, open-source OS made specifically for managing robots. This system functions similarly to the operating system of a computer. Recently the evolution in this regard has been seen in the education sector (Rosenberg-Kima et al., 2020). This includes:

- Controlling the hardware, software, and data storage of the robot.
- Data fusion, concurrency, and parallelism management.
- The prevalence of AI and the accessibility of secret reasoning methods.

Robotics

The study of robotics falls under the umbrella of AI. A robot's mechanics are its form- or function-specific attributes. The robot's electrical components manage the power and movement of the gear. A computer program inside the robot determines what activities are performed, when they are performed, and how the robot does those duties. Recent literature from the domain of higher education indicates the significance of robots as teacher assistants and collective learning (Rosenberg-Kima et al., 2020).

AI and Robotics

Artificial intelligence is a broad discipline that is increasingly being used in other areas, such as medicine, business, and social life. "Actors" are the building blocks of AI and robotics. Actors are software components with their own distinct robot hardware architectures. Control of the robot is achieved by a special link between the human actor and the robot's physical structure. Sensors are used in software to gather information. After the robot has finished reading, it decides and sends commands to its effectors, which causes the robot to interact with its surroundings physically. The area where AI and robotics overlap addresses the following issues:

- Follow-up steps and justifications for the goals to be achieved.
- We model, comprehend and make decisions in open settings.
- Provide ways for robots to communicate and collaborate with people.
- Any feature-based learning model.

Research Methodology

Several works of fiction may be used to provoke contemplation on the future. Narrative scenarios, which are fictional in nature, are used in strategic planning and future studies to capture contrasting potential futures (Amer et al., 2013; Inayatullah, 2008). The stakeholders then utilize these together to decide on preferred directions. More practically, in information system design, a typical design scenario is a brief tale demonstrating the usage of the proposed system and used to demonstrate how it may be used to address an existing issue. Since system design is fundamentally creative, Carroll (1999) says, these situations also take the form of tales or fiction (Blythe, 2017). They are often used to get key people involved in the development of a system. A positive aspect of fictitious settings is that they promote introspection apart from the pressures of having to create anything useful (Carroll, 1999). However, they often reflect a system that operates just as planned (Nathan et al., 2007). Instead, then thinking about the broader social effects of mass technology adoption, they focus narrowly on the people directly involved and the immediate context of usage.

Research on the possible effects of AI and robots in higher education is well suited to the design fiction method. Pinkwarte (2016), Luckin and Holmes (2017), and Selwyn et al. (2017) are just a few of the writers in the area that have made use of them (2020). We used it as a research method; design fiction may summarize complex topics in a concise and accessible format. In essence, they may move the focus of the discussion from the current literature to creating and evaluating concrete AI applications (Zawacki-Richter et al., 2019) and therefore alter the relative importance of the two sides' arguments. The best way for civilization to progress.

Analysis

The present study considered the eight books in the HE domain to evaluate the impact of AI on HE sectors. The eight books that resulted from this method are summarized in Table I. These books speculate about the future of education, administration, and science concerning AI and robots (Table I, column 5). They try to illustrate a wide range of technological possibilities (column 2). While a few are wildly unrealistic, the vast majority are just not that far-fetched (column 3).

Fiction 1 is AIDan the role of teaching assistant indicates the AI facilitates teaching assistance, which is expected to be short. The design is expected to be traditional in the domain of class teaching. Fiction 3 is a critical bot in conversation. The technology will be based on the conversational agent, and it is currently being used in various academic institutions, particularly in higher education. The design of this critical bot is dialogue-based, and its application is pure in the academic sector. Fiction 4 focuses on intelligent campus applications, including mobile and web-based applications. The technology is based on smart campus applications and is expected to follow and is currently used in a few institutions.

Fiction 5 is about research or data management. It focuses on text, auto summarization, and data mining, and the application of this technology is expected to be in the future, particularly in the research domain. The seventh dashboard is based on technology, including data mining and conversation agents, and is expected to be followed in the future. This fiction is expected to be used in the coming future.

Table I
Summary of the Design Fiction

	Technologies Involved	Time Frame	Genre	Area of Application to HE
Fiction 1: AIDan, the teaching assistant	Intelligent tutoring systems, adaptive pedagogical agents, use of sensors to allow affective/embodied adaptivity	future	Traditional design scenario	Teaching
Fiction 2: Football	Robots	Future	Soliloquy	Extra curricula activity
Fiction 3: CriticalBot in conversation	Conversational agent	present	Dialogue	Teaching
Fiction 4: The intelligent campus app	Smart campus: wayfinding, nudging	Present/near future	Mundane, day in the life	Estates management/ Teaching
Fiction 5: Research Management Suite TM	Text and Data Mining, auto summarization, auto writing	Future	Marketing and PR material	Research
Fiction 6: Verbatim minutes of University AI project steering committee: AI implementation phase 3	Not Defined	Near future	Meeting minutes	All
Fiction 7: Dashboards	Data mining, conversation agents	Future	Soliloquy	Administration/Teaching
Fiction 8: Minnie, the AI admin assistant	Conversational agents	Near future	Surreal, cyberpunk dystopic	Administration, Wider social infrastructure

Conclusion

These books all try to provide new perspectives on and discussions about AI. All of this raises questions about the extent to which humans have control over AI and robots, such as the ability to acquire training data (fiction 1) and the ability to override the system (fiction 2). Thirdly, unseen forces are still exerting pressure (novel 3). Fourth Work of Fiction and Growing Inequality. Numerous people voiced concerns about the shifting responsibilities of workers and the expertise needed to succeed in the new business climate. For instance, they are written in a manner that avoids choosing sides so that utopian dreams are not constantly undermined, and grim dystopias are not the only thing shown. Each has parts that may either encourage or divide people. Novels 7 and 8 and the corporate undertones in Novel 5's explicit narrative show facets of AI that were not apparent in the books' brilliant, extremely happy pictures or the deceptively commonplace nature. Readers interested in challenging assumptions about the future are encouraged to go "in the other way" and approach the book. One possible explanation for their fictional status is this.

The narrative literature is reviewed extensively, emphasizing the social, ethical, pedagogical, and administrative concerns of automating via AI and robots in HE. This is the paper's most significant contribution. A second contribution comes from synthesizing the literature research findings into a set of eight user-friendly and implementable design fiction meant to stimulate discussion on the future of AI and robots in higher education.

Limitations

Problems like data being commoditized and playing new functions have been brought to our notice. It has been written by various authors, including developers, visionaries, realists, idealists, and skeptics. It is a plus to attempt to cover themes in an interesting collection of fiction with a total word length of under 5,000, but it is important to remember that only some topics will be portrayed. For instance, we need to discuss how artificial intelligence (AI) and robots are incorporated into the curricula of other disciplines (including languages, computing, and history).

Future Research Directions

Several potential applications for robots in supporting roles or as students need more investigation. The majority of books take place very soon. However, novels set further in the future are not impossible to create. Future studies also need to consider the application of this fiction, particularly the fiction having applications in the present, and there is a need to document the comprehensive framework of how these fictions can be possible in the practical world.

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