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Exploring the Scope of Artificial Intelligence Across Various Domains with a Focus on Its Impact on Education

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Abstract
Artificial intelligence (AI) has emerged as a transformative technology with the potential to replace or augment human capabilities in numerous domains. Defined as the intelligence exhibited by machines or software, AI represents a subfield of computer science that has significantly impacted various aspects of human life. Over the past two decades, AI has made remarkable strides, particularly in enhancing performance in manufacturing, service sectors, and education.
One of the key developments in AI is the emergence of expert systems, which have revolutionized problem-solving in diverse areas such as education, engineering, business, medicine, and weather forecasting. The application of AI technologies has led to improvements in quality and efficiency across these fields, contributing to significant advancements in human productivity and innovation.
This paper provides an overview of AI technology, exploring its meaning, search techniques, key inventions, and future prospects. Furthermore, it examines the scope of AI in different areas, with a special focus on its use in education. By leveraging AI-powered educational tools and systems, educators can personalize learning experiences, optimize instructional processes, and enhance student outcomes. Additionally, AI holds the potential to facilitate lifelong learning and skill development, offering adaptive and personalized learning pathways tailored to individual learner needs.
Through a comprehensive review of existing literature and case studies, this paper aims to elucidate the multifaceted scope of AI in education and its transformative potential. It also discusses future directions and opportunities for further research and innovation in this rapidly evolving field of AI.

Keywords: artificial intelligence (AI), artificial neurons (neural computer networks), expert system, heuristic, searching techniques

1. Introduction

It is claimed that artificial intelligence is playing an increasing role in the research of educational technology, anagement sciences and operational research areas. Intelligence is commonly considered as the ability to collect knowledge to solve complex problems. In the near future intelligent machines will replace human capabilities in many areas. Artificial intelligence is the study of intelligent machines and software that can reason, learn, gather knowledge, communicate, manipulate and perceive the objects. John McCarthy coined the term in 1956 as branch of computer science concerned with making computers behave like humans. It is the study of the computation that makes it possible to perceive reason and act. Artificial intelligence is different from Psychology because it emphasis on computation and is different from computer science because of its emphasis on perception, reasoning and action. It makes machines smarter and more useful. It works with the help of artificial neurons (artificial neural network) and scientific theorems (if then statements and logics). AI technologies have matured to the point in offering real practical benefits in many of their applications. Major artificial intelligence areas are Expert systems, Intelligent computer aided instructions, Natural language processing, Speech understanding, Robotics and sensory systems, Computer vision and scene recognition, Neural computing. From these expert system is a rapidly growing technology which is heaving a huge impact on various field of life. The various techniques applied in artificial intelligence are Neural network, Fuzzy logic,

Evolutionary computing, Computer aided instructions and Hybrid artificial intelligence.

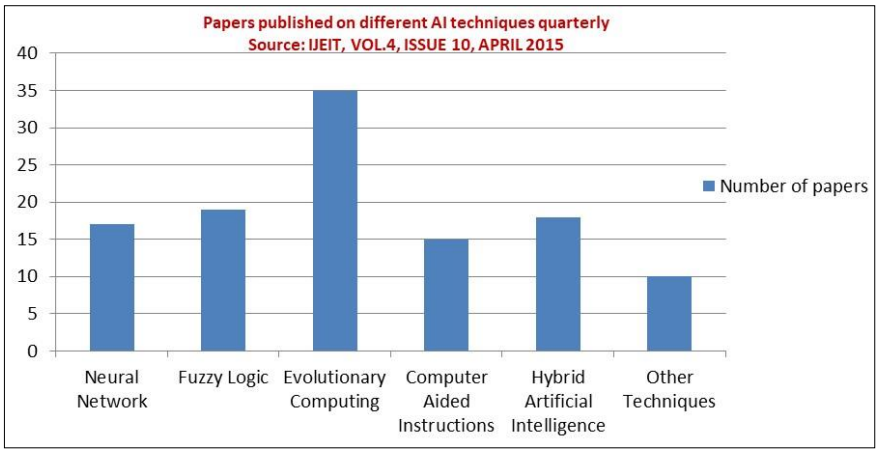

Fig 1: Papers published on different AI techniques quarterly.

Artificial intelligence has the advantages over the natural intelligence as it is more permanent, consistent, less expensive, has the ease of duplication and dissemination, can be documented and can perform certain tasks much faster and better than human. Thus is effective in educational technology to make the teaching learning process more effective and concrete with the help of various artificial intelligence teaching techniques.

2. Meaning of artificial intelligence

Artificial intelligence is the combination of two words artificial + intelligence. Where artificial means 'not real' or 'natural' and by intelligence means 'the ability to reason, to trigger new thoughts, to perceive and learn'. Artificial intelligence can be defined that area of computer science that mainly focus on the making on such kind of intelligent machines that work and give reactions same like human beings. It is combination of many activities which includes for designing the artificial in computers that are like-recognizing the speech, learning, planning and solving the problem. When any system adapts itself according to situation in any environment is called intelligent. In other words, it can be defined as programming such machines which can think and act with some level of human intelligence is known as artificial intelligence. Artificial intelligence can be defined as efficiently use of limited resources. So artificial intelligence can be defined as making computer programs to solve complex problems same like as human solve the problems. So it is also divided into two parts one is to solving complex problems by the machine and second is same like human beings. The term artificial intelligence is also used to describe a property of machines or programs: the intelligence that the system demonstrates. Artificial intelligence is combination of science and engineering for making the machines which behaves in intelligent manner. In it many fields are combined like philosophy, psychology and computer science.

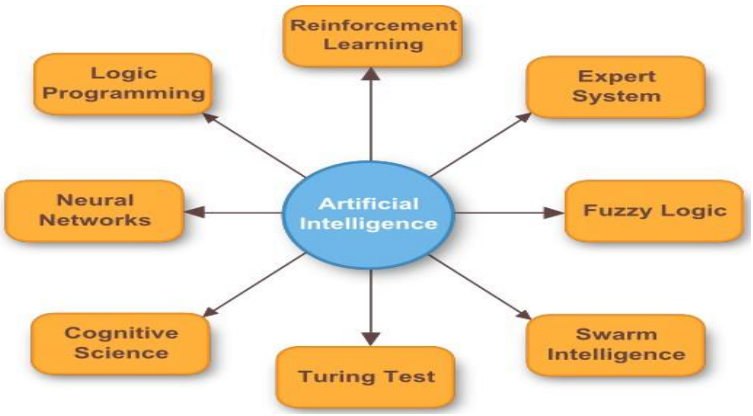

Fig 2: Factors included in AI

3. Scope of artificial intelligence in different areas

3.1. In the field of education

3.1.1. Artificial intelligence can automate basic activities in education, like grading

While AI may not ever be able to truly replace human grading, it's getting pretty close. It's now possible for teachers to automate grading for nearly all kinds of multiple choice and fill-in-the-blank testing and automated grading of student writing may not be far behind. Today, essay-grading software is still in its infancy and not quite up to par, yet it in college, grading homework and tests for large lecture courses can be tedious work, even when TAs split it between them. Even in lower grades, teachers often find that grading takes up a significant amount of time, time that could be used to interact with students, prepare for class, or work on professional development.

3.1.2. Educational software can be adapted to student needs

From kindergarten to graduate school, one of the key ways artificial intelligence will impact education is through the application of greater levels of individualized learning. Some of this is already happening through growing numbers of adaptive learning programs, games, and software. These systems respond to the needs of the student, putting greater emphasis on certain topics, repeating things that students haven't mastered, and generally helping students to work at their own pace, whatever that may be.

This kind of custom tailored education could be a machineassisted solution to helping students at different levels work together in one classroom, with teachers facilitating the learning and offering help and support when needed. Adaptive learning has already had a huge impact on education across the nation (especially through programs like Khan Academy), and as AI advances in the coming decades adaptive programs like these will likely only improve and expand.

3.1.3. It can point out places where courses need to improve

Teachers may not always be aware of gaps in their lectures and educational materials that can leave students confused about certain concepts. Artificial intelligence offers a way to solve that problem. Coursera, a massive open online course provider, is already putting this into practice. When a large number of students are found to submit the wrong answer to a homework assignment, the system alerts the teacher and gives future students a customized message that offers hints to the correct answer.

This type of system helps to fill in the gaps in explanation that can occur in courses, and helps to ensure that all students are building the same conceptual foundation. Rather than waiting to hear back from the professor, students get immediate feedback that helps them to understand a concept and remember how to do it correctly the next time around.

3.1.4. Students could get additional support from AI tutors While there are obviously things that human tutors can offer that machines can't, at least not yet, the future could see more students being tutored by tutors that only exist in zeros and ones. Some tutoring programs based on artificial intelligence already exist and can help students through basic mathematics, writing, and other subjects.

These programs can teach students fundamentals, but so far aren't ideal for helping students learn high-order thinking and creativity, something that real-world teachers are still required to facilitate. Yet that shouldn't rule out the possibility of AI tutors being able to do these things in the future. With the rapid pace of technological advancement that has marked the past few decades, advanced tutoring systems may not be a pipe dream.

3.1.5. AI-driven programs can give students and educators helpful feedback

AI can not only help teachers and students to craft courses that are customized to their needs, but it can also provide feedback to both about the success of the course as a whole. Some schools, especially those with online offerings, are using AI systems to monitor student progress and to alert professors when there might be an issue with student performance. These kinds of AI systems allow students to get the support they need and for professors to find areas where they can improve instruction for students who may struggle with the subject matter. AI programs at these schools aren't just offering advice on individual courses, however. Some are working to develop systems that can help students to choose majors based on areas where they succeed and struggle. While students don't have to take the advice, it could mark a brave new world of college major selection for future students.

3.1.6. It is altering how we find and interact with information

We rarely even notice the AI systems that affect the information we see and find on a daily basis. Google adapts results to users based on location, Amazon makes recommendations based on previous purchases, Siri adapts to your needs and commands, and nearly all web ads are geared toward your interests and shopping preferences.

These kinds of intelligent systems play a big role in how we interact with information in our personal and professional lives, and could just change how we find and use information in schools and academia as well. Over the past few decades, AI-based systems have already radically changed how we interact with information and with newer, more integrated technology, students in the future may have vastly different experiences doing research and looking up facts than the students of today.

3.1.7. It could change the role of teachers

There will always be a role for teachers in education, but what that role is and what it entails may change due to new technology in the form of intelligent computing systems. As we've already discussed, AI can take over tasks like grading, can help students improve learning, and may even be a substitute for real-world tutoring. Yet AI could be adapted to many other aspects of teaching as well. AI systems could be programmed to provide expertise, serving as a place for students to ask questions and find information or could even potentially take the place of teachers for very basic course materials. In most cases, however, AI will shift the role of the teacher to that of facilitator.

Teachers will supplement AI lessons, assist students who are struggling, and provide human interaction and hands-on experiences for students. In many ways, technology is already driving some of these changes in the classroom, especially in schools that are online or embrace the flipped classroom model.

3.1.8. AI can make trial-and-error learning less intimidating

Trial and error is a critical part of learning, but for many students, the idea of failing, or even not knowing the answer, is paralyzing. Some simply don't like being put on the spot in front of their peers or authority figures like a teacher. An intelligent computer system, designed to help students to learn, is a much less daunting way to deal with trial and error. Artificial intelligence could offer students a way to experiment and learn in a relatively judgment-free environment, especially when AI tutors can offer solutions for improvement. In fact, AI is the perfect format for supporting this kind of learning, as AI systems themselves often learn by a trial-and-error method.

3.1.9. Data powered by AI can change how schools find, teach, and support students

Smart data gathering, powered by intelligent computer systems, is already making changes to how colleges interact with prospective and current students. From recruiting to helping students choose the best courses, intelligent computer systems are helping make every part of the college experience more closely tailored to student needs and goals. Data mining systems are already playing an integral role in today's higher-ed landscape, but artificial intelligence could further alter higher education. Initiatives are already underway at some schools to offer students AI-guided training that can ease the transition between college and high school. Who knows but that the college selection process may end up a lot like Amazon or Netflix, with a system that recommends the best schools and programs for student interests.

3.1.10. AI may change where students learn, who teaches them, and how they acquire basic skills

While major changes may still be a few decades in the future, the reality is that artificial intelligence has the potential to radically change just about everything we take for granted about education.

Using AI systems, software, and support, students can learn from anywhere in the world at any time, and with these kinds of programs taking the place of certain types of classroom instruction, AI may just replace teachers in some instances (for better or worse). Educational programs powered by AI are already helping students to learn basic skills, but as these programs grow and as developers learn more, they will likely offer students a much wider range of services.

3.2 Language understanding:

The ability to "understand" and respond to the natural language. To translate from spoken language to a written form and to translate from one natural language to another natural language. 1. Speech Understanding

2. Semantic Information Processing (Computational Linguistics)
3. Question Answering
4. Information Retrieval
5. Language Translation

3.3 Learning and adaptive systems:

The ability to adapt behavior baged on previous experience, and to develop general rules concerning the world based on such experience.

1. Cybernetics

2. Concept Formation

3.4 Problem solving

Ability to formulate a problem in a suitable representation, to plan for its solution and to know when new information is needed and how to obtain it.

1. Inference (Resolution-Based Theorem Proving, Plausible Inference and Inductive Inference)
2. Interactive Problem Solving
3. Automatic Program Writing
4. Heuristic Search

3.5 Robots

A combination of most or all of the above abilities with the ability to move over terrain and manipulate objects.

1. Exploration
2. Transportation/Navigation
3. Industrial Automation (e.g., Process Control, Assembly Tasks, Executive Tasks)
4. Security
5. Other (Agriculture, Fishing, Mining, Sanitation, Construction, etc.)
6. Military
7. Household

3.6 Games

The ability to accept a formal set of rules for games such as Chess, Go, Kalah, Checkers, etc., and to translate these rules into a representation or structure which allows problemsolving and learning abilities to be used in reaching an adequate level of performance.

3.7 For emergency services

When we allow handling emergency to A.I then it is more beneficial for us. Because when some emergency come like fire, flood then we can send metal or silicon firefighters to save people because they have no danger to loss life, machines can also defy higher temperatures and can tolerate smoke easily and can search easily in close-quarters by using lasers and radar where as people may not be able to see. Firefighting was first field where artificial intelligent machines were used but now this concept is used in many fields like driving ambulances, handling dangerous law enforcement situations, and even cleaning up hazardous leaks or spills are prime examples. Now Navy is using this technology on the water, and some are developing it for use in cities.

3.8 For Entertainment

We can apply artificial intelligence to the world of music, can make artificial director which see the real world and can generate the stories. We can make the robots which compose music and pitch and robots can create your favorite songs. New technology is also able to restore to life of that stars which are dead like Tupac Shakur and Michael Jackson etc.

3.9 For providing services to customers

Now a day's, for providing services to the customer artificial intelligence is using in place of human being. When any person does calculation like preparing bill, handling account information he can do calculation error but machine do calculation properly and no mistake is done by the machine. Artificial intelligence also has a component that is natural language processing with the help of which human being can directly communicate with machine in their natural language and can get services directly.

hill-climbing, best first search etc. it tries to find out the optimal solution of complex problem at low cost and in minimum time. For an example it take decision whether to accept a proposed credit card purchase.

3.10 In Heuristic Classification

information from many sources and collect at one place. In The main characteristics expert system is to collect heuristic classification many search techniques are used like

4. Searching techniques in artificial intelligence In AI for finding the solution of problem searching has to be done because solution is not known in advance. For it AI programs are developed which do the searching process for solution because solution steps are not known before hand and have to be found out. For doing searching following steps are required. So we can say that searching is a process which transform initial state to goal state.

1. Initial state
2. A set of legal operators
3. Goal state or final state

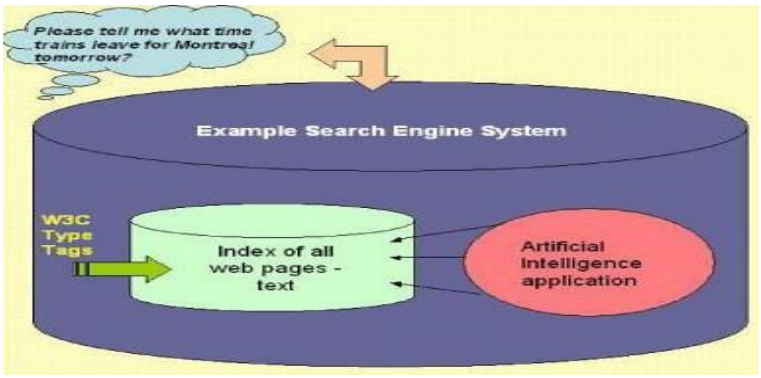

Fig 3 Working of a search engine

5. Invention in the field of AI

An American scientist John McCarthy invented the term Artificial Intelligence and he has credit of founder of Artificial Intelligence. He was a computer and cognitive scientist and was very popular early development of AI In the 1940s and 50s, many scientists from diversity fields like mathematics, psychology, engineering, economics and political science started to try to make a artificial mind which work like human in the year of 1940 and 50 and started academic in the year of 1956. For using the semantic net first program of AI was written by Ross Quillian. We can define semantic net as like graph in which nodes represent the concept and arrow is used for providing link between the nodes. A quiz was one in Feb 2011, named with Jeopardy! Quiz show it was an exhibition match. And the competition was in between the IBM's question answering system named as Watson and two champions named as Brad Rutter and Ken Jennigs and that system beaten hem by a great margin.

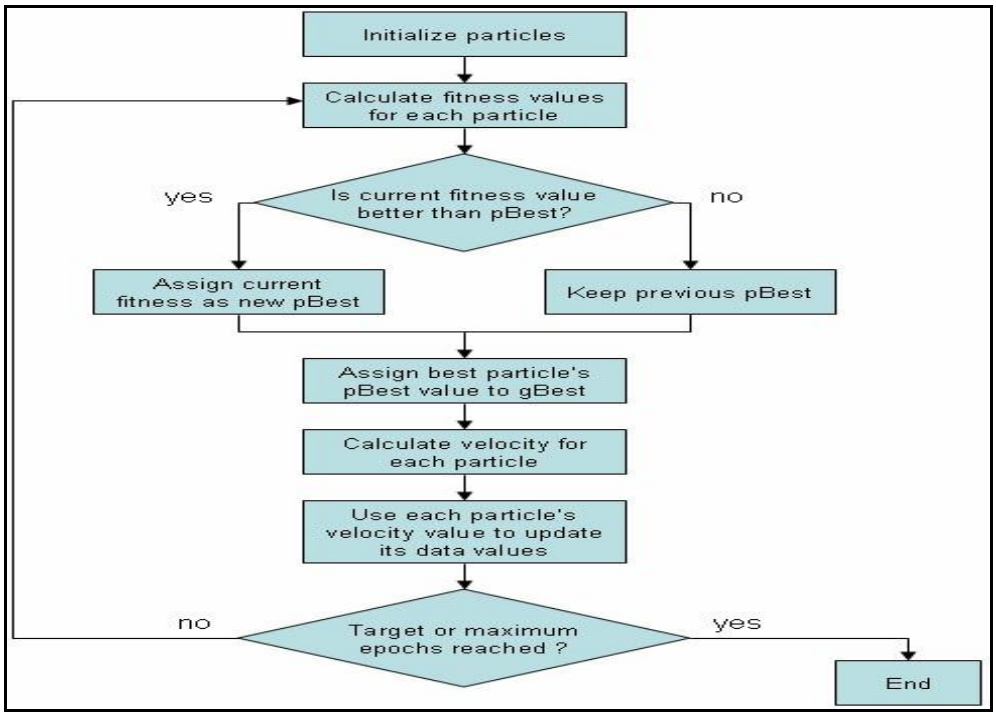

Fig 4: Example of searching in AI

Searching in AI is broadly classified into two parts-

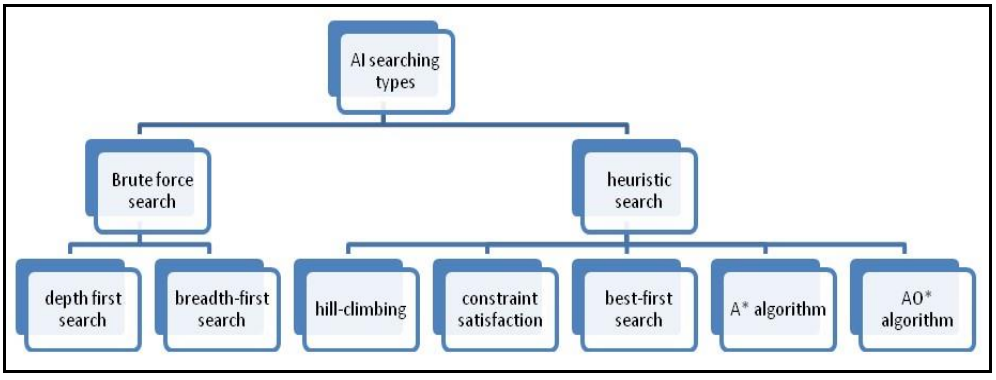

Fig 5: Different searching types in AI

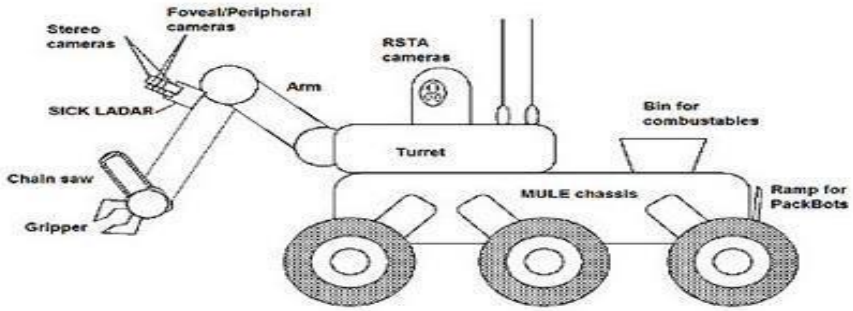

Fig 6: Example of robot

6. The future of AI

It is true that many experts are doing research in the field of Artificial intelligence and in future machines will become more and more powerful. But anything which has advantages there exist disadvantages also so there can be ethical issues related to machines. For example, if any machine is made for very sensitive work and did any mistake than who will be responsible. If an AI program is made for diagnosis purpose and it gives the wrong answer, then we cannot claim the doctor for it. So for it policy will have to make. And in future such kind of machines will be developed which will communicate with us same like the human and will be able to guess what should be done in which situation.

7. Conclusion

The field of artificial intelligence gives the ability to the machines to think analytically, using concepts. Tremendous contribution to the various areas has been made by the Artificial Intelligence techniques from the last 2 decades. Artificial Intelligence will continue to play an increasingly important role in the various fields. This paper is based on the concept of artificial intelligence, scope of artificial intelligence in different areas with special to “the field of education”. As all know artificial intelligence is intelligence behavior of machines which is given by the professional. As you all know artificial intelligence have simplified our life in every aspect it can be article writing or game playing or taking any important decision. In any machine many experts mind can be combined which is more powerful than a single expert mind. Many labors work can be done by a single machine and good thing of it is that it never tired. Now such types of robots are going to make which have emotions it will finish the loneliness of the person. But it has another aspect that is can be dangers for us. If we become completely dependent on that machines than it can ruin our life as we do not do any work ourselves and got lazy. And another is that it cannot give the feeling like human. So machines should be used only where there those are actually required.

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