



(REVIEW ARTICLE)



A review on applications and uses of Artificial Intelligence

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Abstract

Artificial intelligence (AI) is a field of computer science which aims to mimic cognitive knowledge of humans to machines. The growth of AI in the past decade is tremendous and soon in the future it will be widely used in many fields. This growth might involve replacing humans or helping humans to finish their work quicker. Even though the use of AI is beneficial in all fields, it also has lots of limitations associated with it when used in any field. The potential barriers which hinder the growth of AI include the development of suitable algorithms, data security and privacy issues. Hence, it is crucial to analyse the advantages and limitations before implementing AI in any field to determine the role of AI in that particular field. AI's growth is most notable in the four fields namely medicine, banking, education and agriculture. This paper analyses the uses and the applications of AI along with the advantages, drawbacks and limitations of using AI in each field.

Keywords: Machine learning; Deep learning; Algorithms; Artificial intelligence

1. Introduction

Artificial Intelligence (AI) is a rapidly growing subfield in the field of computer science. AI is computer-based system having human intelligence. AI has transformed rapidly from a theoretical concept to a driving force shaping our world. AI tries to replace humans by depicting their actions and intelligence and transforms the way we live, work and interact with the technology. In the current technological era, AI can be implemented in many fields in order to reduce human intervention. Some major fields in which AI is implemented are medicine, banking, education and agriculture. All these fields play a vital role in everyday life of humans. Implementing AI in these fields would advance the technologies used in these fields.

AI is widely used in medicine for various purposes from tracking patients records to performing surgeries. The growth of AI in the field of medicine is significant as AI has now started to perform surgeries with doctors' supervision. Moreover, AI is used in banking in various applications such as AI chatbots which helps the customers to do banking easily with lots of banking tips and tricks and AI tracking systems which tracks customers' banking history accurately. Furthermore, AI is also used in education where it is used in automated grading, personalized learning and intelligent tutoring systems to help students learn better. Lastly, AI is used in agriculture to harvest and cultivate the crops at the right time. Moreover, it also predicts the best time to cultivate particular crops based on the environmental conditions.

The applications of AI in the fields of medicine, banking, education and agriculture will be highlighted. Moreover, the advantages, limitations and drawbacks of implementing AI in each field will be discussed.

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2. AI in medicine

AI is used extensively in the field of medicine for classification, diagnosis and prognosis of diseases. AI is widely used in radiology in the prediction of abnormal and negative cases in CT scans, X-rays and MRI scans (Amisha et al., 2019). AI can identify the structures in various scans. Research has shown that AI can be used for detection, classification and segmentation in thoracic, abdominal and pelvic regions (Jin et al., 2021). AI is used in medical image recognition such as identifying the structures in a medical scan report (Bohr & Memarzadeh, 2020). Furthermore, AI with ML algorithms such as KNN, Naive Bayes and Decision tree are used to diagnose diabetes by identifying threats at the initial stage itself. Moreover, the image classification algorithms help to analyse the image to detect liver diseases. The algorithms used to detect malignant tumours are more accurate than human radiologists. AI can manage the health records of the patients successfully and hence can help save 25 percent time spent by nurses in US on administrative and regulatory works (Mashraqi & Allehyani, 2022).

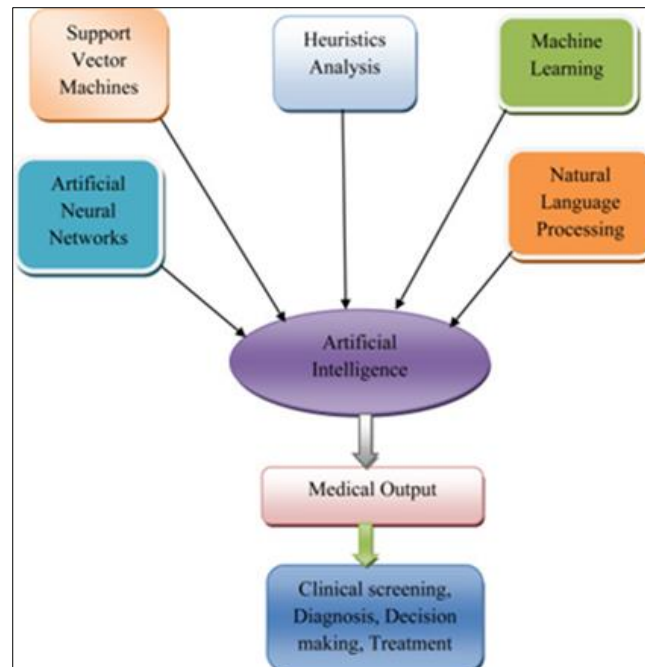


Figure 1 AI in Medicine (Haleem et al., 2019)

AI can be used to diagnose people in diseases such as cancer and strokes. Machine learning (ML) is used to train the AI to treat patients with lung cancer by analysing the LDCT images of the lung to detect tumours. AI can also be trained using algorithms such as SVM (Support Vector Machine) and CNN (Convolutional Neural Network) to detect the type of stroke in patients (George & Bijimol, 2021). Retinal fundus imaging is used by AI to detect diabetic retinopathy. Moreover, skin cancer is classified into its dermatological types by AI (Derrington, 2017). AI can be used to provide solution for genetic-based diseases in people by creating specialised medicine. It can also be used to develop new drugs by predicting the new property and activity of a drug molecule and designing new drug structures (Bohr & Memarzadeh, 2020).

In the field of ophthalmology, IDx-DR was the first AI device used to classify diabetic retinopathy (DR) with a sensitivity of 87.4 percent and specificity of 89.5 percent. In treating age-related macular degeneration (AMD), ML algorithms have shown a high sensitivity from 84.2 to 94.3 percent. In the field of dentistry, one of the AI techniques known as neural networks is used in radiographs, to predict the presence of cavities. The results showed an accuracy of 97.1 percent indicating that this technique is more effective than the traditional methods. In the field of psychology, deep learning (DL), one of the AI techniques, is used to analyse the mental illness in the starting stages and it prevents potential threats to people. It analyses extensively from clinical records such as family details and suicide attempts to social media behaviours to analyse the potential risk factors which might lead to depression (Xu et al., 2023).

In addition to this, AI is used in preoperative, intraoperative and post-operative stages. Robots can perform surgeries by mimicking the hand movements of the doctors (Amisha et al., 2019). AI is also used in robots to perform surgeries with the ability to respond to complicated situations, to take real-time decisions and to perform surgeries with increased

precision, safety, efficiency and automation. Even it is used in bone tumour surgery to accurately locate the cutting-edge and hence provide a better postoperative experience (Liu et al., 2021). However, a doctor’s supervision is always advisable to look after it for any unexpected situations during the surgery (Köse et al., 2018).

Another aspect where AI is implemented is drug production. AI has reduced the time and research cost put in vaccine design with its accurate predictions. AI in three-dimensional printing (3DP) has helped to design drugs in the desired shape, size and ingredients. This makes it easy to use in different clinical applications. In the healthcare industry, 3DP also helps in printing body parts and tissues using materials such as powdered metals and adhesive biomaterials based on the digital design created in software based on the patients’ requirement (Liu et al., 2021).

The drawbacks of implementing AI in medicine are many. Firstly, the lack of adequate data necessary to train the AI using ML algorithms. The accuracy of AI in medicine depends on the ML algorithm used to train the AI. Moreover, data security and privacy are concerns when human data is collected and hence the data must be handled securely. The quality of the data must be checked and only then used to train the ML algorithm which is challenging. Furthermore, there is a possibility of bias in the data that is used to train the ML model. Moreover, the use of AI in medicine will raise both ethical and social concerns which includes accountability, responsibility and replacement of humans with AI. Accountability and responsibility issues occur as there is no one to blame when mistakes happen in AI diagnosis or treatment. People also feel that AI will soon replace humans and will soon take away all jobs (Khan et al., 2023).

3. AI in banking

“To thrive in the AI-powered digital age, banks will need an AI-and-analytics capability stack that delivers intelligent, personalized solutions and distinctive experiences at scale in real time.” (Thomas, 2021). AI is used in banking industry to improve business, to meet the expectations of the consumers and to provide seamless service. “Building the AI bank of the future will allow institutions to innovate faster, compete with digital natives in building deeper customer relationships at scale, and achieve sustainable increases in profits and valuations in this new age.” (Thomas, 2021).

A survey from 200 people, of which 170 are customers and 30 are bankers, showed that AI in banking benefits the customers and the bank (Cristi et al., 2023). It also reveals that the use of AI reduces the errors in the transaction processes and simplifies the banking processes. It claims that AI saves lot of time and brings in transparency in the transactions. Another survey’s results states that AI applications in banking is useful as the results for yes in using AI in these applications are above 50% The most useful application of AI is KYC/AML followed by fraud detection and prevention and then chatbots (Geetha, 2021).

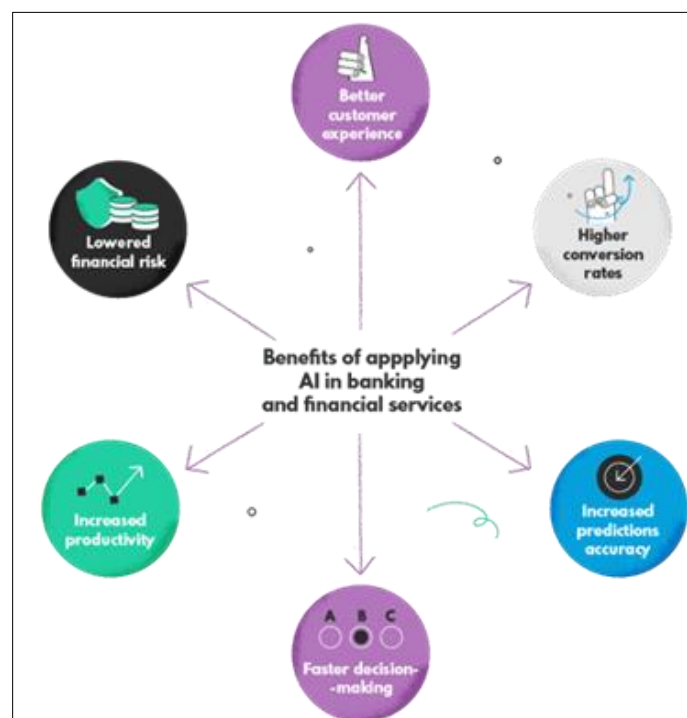


Figure 2 Benefits of AI in Banking (Dorota-Owczarek, 2023)

AI can be used to prevent cyber threats, predict failures in banks and predict credit ratings. The results from different machine learning algorithms produced different accuracy levels and most being above 50 percent accurate (Farishy, 2023). Hence, AI usage in these applications is reliable. Moreover, AI is also used in these applications such as drive-through banking services where people can do banking from a car itself, bank stations where people can do banking services in a machine, passbook update kiosks where the people can print their own passbooks, ATM machines, cash deposits machines and mobile banking (Suma & Anupama, 2021).

To add on, AI can be used to provide personalized banking experiences to the customers by using natural language processing technique and the analysis of customer data. AI can be used to identify fraudulent activities easily. It can process large volumes of data and apply different algorithms to find out if any fraudulent activity is going on. AI chatbots allows banking services 24/7 and hence make it easy for customers to do banking at their convenient time. Banks can reduce the errors in banking systems and also automate many of the manual tasks in the banks and hence the operational costs for the banks are reduced. Furthermore, AI-based algorithms are more reliable in approving the loan for the individuals or companies based on their transaction history, credit scores and credit history (Kaushik & Sharma, 2023). In addition to this, AI is also used to create reports for each customer within seconds. If this task is done manually by the bank employees, then it would take hours to gather data of each customer and create a report (Lakhangaonkar & Kamath, 2021).

Interactive Voice Response Systems (IVRS) is an AI-powered voice system that helps to answer particular queries asked by the customers on call. Moreover, AI is also used to provide financial guidance to the consumers on how to manage their money efficiently (Tripathi et al., 2022). In India, the diversity of people and languages are varied. Hence, to implement AI in banking, the AI should be trained to help people in their native languages. However, due to lack of enough training data available for natural language processing in many native languages, the AI cannot be trained to understand these native languages and do the banking efficiently (Sawant et al., 2023).

The possible limitations of AI in banking are data quality, technical expertise and privacy and security concerns. Data quality is affected as the accuracy rate in AI is not 100 percent and hence banks should manage them properly. Since AI is a new technology, the banks need to hire people with AI knowledge for implementation and maintenance which costs a lot. Privacy and security are the main concerns as AI could be hacked and the personal information could be misused (Nagarajan et al., 2023). One of the major drawbacks of AI is the emotional connect with the customer. The emotional connect between the customer and the bank is lacking when AI is used in the banking sectors. To add on, AI lacks out of box thinking ability. It only works on the algorithms that is loaded to it and if it encounters a new situation, it cannot take prompt actions and so, the system crashes (Tripathi et al., 2022).

4. AI in education

AI plays a critical role in the educational sector. AI can change the role of teachers and the way of teaching and help them in grading. AI chatbots can act as tutors and clarify students' doubts and AI-driven programs can give feedback to students as well as teachers on the performance (Neha, 2020). AI is proven to provide the flexibility and the time for the students to learn at their own pace. AI can also help in individualised and adaptive learning where it can focus on giving individual attention to students (Jain & Jain, 2019).

Table 1 Techniques for scenarios of AI education (Chen et al., 2020)

Scenarios of AI education	AI-related techniques
Assessment of students and schools	Adaptive learning method and personalized learning approach, academic analytics
Grading and evaluation of paper and exams	Image recognition, computer-vision, prediction system
Personalized intelligent teaching	Data mining or Bayesian knowledge interference, intelligent teaching systems, learning analytics
Smart school	Face recognition, speech recognition, virtual labs, A/R, V/R, hearing and sensing technologies
Online and mobile remote education	Edge computing, virtual personalized assistants, real-time analysis

The implementation of AI in education is already in planning phase. The table 1 above shows how different AI techniques can be used to tackle different tasks. Image recognition, computer vision and prediction system are used for grading and evaluation of paper (Chen et al., 2020).

One of the major applications of AI in education is automated grading. In automated grading, AI is used to score or grade the answer script. Then, it will also give a detailed analysis on why the marks are awarded and how it could be improved by highlighting the areas of improvement. AI is now used to analyse the given subjective answer using four features which includes word and sentence count, parts of speech, spelling mistakes and domain information content. Moreover, AI analyses the essays and understands the content of it to assess the relevancy of the essays to the given topics (Zatsarenko et al., 2021).

The main drawback of AI in education is that AI cannot fulfil all the requirements of different people because many AI techniques used are generally written for common situations while it cannot be applicable to specific learning goals and teaching goals (Zhai et al., 2021). To add on, AI is not efficient in marking assessments because researches have shown that AI cannot mark effectively when images or diagrams come in between and hence the accuracy of marking is reduced greatly. Moreover, the lack of technological knowledge of school administration and teachers pose a threat in implementing AI in education (Celik et al., 2022). In addition to this, AI can suppress the thinking capabilities of students due to the dependency on technology and can negatively affect social relationships (Gocen & Aydemir, 2020). Moreover, AI reduces the physical interaction between the students as they study through AI and there is also a possibility of students getting addicted to the technology which might disrupt their education rather than helping them. Furthermore, AI poses serious privacy issues as personal data of students are involved (Kengam, 2020).

5. AI in agriculture

As in any other field, AI has also made an evolutionary change in the field of agricultural. In agriculture, AI could be mainly implemented in these seven applications namely crop management, water management, soil management, fertigation, crop prediction, crop classification, and disease and pest management (De Oliveira & De Souza E Silva, 2023).

AI is the only solution to food scarcity by using decreased labour and lesser agricultural land as AI improves the efficiency of farming (Zha, 2020). AI robots can be employed to perform agricultural tasks at a faster rate. For example, tractors can use GPS and machine vision to spray pesticides across agricultural area by programming paths for it to travel. Also, drones can be used to monitor crops and soil health using deep learning and computer vision (Gambhire & Mohammad, 2020). Moreover, AI can be used for predictive analysis to improve the overall farming production and profit on long term (Mahibha & Balasubramanian, 2023). For example, the best crop which can be grown at one particular season can be identified by AI with the weather records. AI can be implemented to monitor the plant health and the soil nutrients and take prompt actions to bring to the optimum conditions. Moreover, it can be used to monitor conditions such as weather, temperature and water availability by using data science. AI can diagnose pest diseases and improve the quality of the crop grown by continuously monitoring and sending signals to take appropriate actions (Kaushal, 2023). Furthermore, autonomous robots built with AI and ML algorithms can automatically harvest and pick the crops from the farm at the right time quickly (Sinha et al., 2023).

AI can also monitor livestock using Internet of Things (IoT) and sensors which will constantly measure the pulse rate, pressure, location and temperature. Any abnormalities observed in the livestock is immediately intimated to the farmer as an alert in mobile phone. Moreover, movement in the farm is detected by the AI and if it finds an abnormal movement causing threat to the quality and yield of the crop, then it will immediately send notification to the mobile. Solar grasscutter and automated irrigation machines help to prevent weed growth and irrigate water respectively in the farm by taking appropriate actions immediately (Sinha et al., 2023). A major advantage of AI in agriculture is that natural language processing (NLP) can be used to advise farmers on the sustainable and profitable agricultural practices in their own language and hence will prevent any content related to agriculture being undelivered to the farmers (Rawat et al., 2022).

On the other hand, there are some limitations in using AI in agriculture. Firstly, AI requires huge amount of data to work effectively which will bring in big data and big data is both costly and difficult to handle. Moreover, the implementation of AI is very difficult as proper training is required for using AI with big data (Eli-Chukwu, 2019). Farmers who are not trained with AI cannot use AI for farming and so, they need to hire experts to operate AI (Gambhire & Mohammad, 2020).



Figure 3 AI in Agriculture (Sinha et al., 2023)

6. Conclusion

Artificial Intelligence is a growing technology which will be used in a wide range of applications in the fields of medicine, banking, education and agriculture. The implementation of AI in these fields is halfway in the process. In the field of medicine, AI can very well help the doctors in analysing a scan or taking care of patients' health records however AI cannot replace doctors fully because AI cannot take on the spot decisions during a surgery. In the field of banking, AI could be implemented as the pros of AI in this field are tremendous but however AI should be protected securely to store personal information carefully. In the field of education, AI can help the teachers to teach a concept better and correct objective answer scripts but it cannot replace teachers because AI cannot assess the answer scripts of description type and mimic the teaching methodology used by the teachers. In the field of agriculture, AI can be implemented because AI increases the cultivation rate with decreased labour and land. However, AI should be trained using advanced algorithms to make it work with little human intervention. To sum up, implementing AI fully in various fields is in the hands of future generation to find solutions to the challenges faced by AI.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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