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Artificial Intelligence in Healthcare

Ziyi Zhang *

Zhoushan High School, Zhejiang, Ningbo, 316021, China
* **Corresponding author Email:** Ziyi15958289855@163.com

Abstract: This paper discusses the development history of artificial intelligence (AI) technology and its application in the medical field, including its progress in medical image analysis, intelligent diagnosis, drug development and genomics. It analyses how AI technology breaks through the imbalance between the supply and demand of medical resources, reduces the misdiagnosis rate, and promotes scientific medical decision-making. The application of AI technology in medical data processing and analysis is demonstrated through a case study of Mediadu Cloud, and its advantages and challenges are discussed. Finally, countermeasures such as data standardisation and technological innovation are proposed to promote the healthy development of AI technology in the medical field.

Keywords: Artificial intelligence; Healthcare applications; Data governance; Intelligent diagnostics; Medu cloud.

1. Introduction

Health is the basis of the people's general pursuit of a better life. The report of the 19th CPC National Congress explicitly incorporates the implementation of the Healthy China Strategy into the basic strategy of national development , elevates people's health to the status of "an important indicator of national prosperity and national strength", and emphasises the need to "provide people with comprehensive and sustained health The basic strategy In recent years, as a key driving force of the new round of technological revolution and industrial change, the combination of AI with the medical field is of far-reaching significance for the development of modern healthcare, and accelerating the efficient application of AI in the field of healthcare is self-evidently of great importance to individuals and society. Domestic research in the field of medical AI mainly focuses on medical image analysis, intelligent diagnosis, drug development and genomics. Current research hotspots include the application of deep learning in medical image recognition and disease prediction models based on big data. Many domestic enterprises have launched AI-based assisted diagnosis systems, such as intelligent image interpretation and pathology analysis, which have achieved significant results in improving the quality and efficiency of medical services.

2. History of artificial intelligence

The history of Artificial Intelligence is a history full of innovations and breakthroughs.In 1943, psychologist Warren McCulloch, together with mathematical logician Walter Pitts, published a paper titled "The Logical Arithmetic of Thought Intrinsic to Nervous Activity", which proposed for the first time a model of the MP, a model which signalled the beginning of attempts to elucidate the process of thinking through the activity of neurons in the brain, and proposed an implementation method of utilising a a large number of nonlinear parallel processors to simulate the implementation of human neurons.In 1949, in his book The Organisation of Behaviour, Donald Herb, a distinguished Canadian psychologist, proposed a Herb's Learning Rule based on unsupervised learning2 This was the first time that anyone had proposed the concept of self-training of algorithms through the adjustment of weights, and it laid a solid foundation for subsequent research. In 1950, Alan Turing put forward the concept of "thinking machine", and published the landmark "Turing test" paper, which provided a solid theoretical foundation for the development of artificial intelligence.

In 1956, the Dartmouth Conference marked the formal establishment of the discipline of artificial intelligence. In 1956, the Dartmouth Conference marked the formal establishment of the discipline of Artificial Intelligence, where scientists explored how to use machines to simulate human intelligence, and for the first time introduced the term "Artificial Intelligence" (AI). 1959 marked an important milestone in the field of industrial automation and Artificial Intelligence, with the creation of the first industrial robot, the Unimate Robot, developed in collaboration with Josef Ingeborg. The successful development and promotion of the Unimate robot not only highlighted the enormous potential of robotics in industrial applications, but also signalled that robots would become an integral part of modern industrial production. Its introduction makes "machine instead of manpower" a reality, promotes the acceleration of industrial automation process, and expands the application of artificial intelligence technology to new areas. Since then, robots have transformed from a fictional concept in science fiction to an indispensable tool in real production and life.The birth of Unimate robots is another major technological breakthrough after the Industrial Revolution, which has had a far-reaching impact on the advancement of human society.In 1969, Marvin Minsky, the father of artificial intelligence, and Simon Minsky, the founder of the LOGO language, developed the Unimate robot. In 1969, Marvin Minsky, the "Father of Artificial Intelligence", and Simon Pipert, the founder of LOGO language, jointly proved the limitations of single-layer perceptron in solving linear indivisibility problems. 1982, John Hopfield, a famous physicist, invented Hopfield neural network, which has a very different structure from that of traditional neural networks. In the same year, Marvin Minsky won the Turing Award, establishing him as a pioneer in the field of artificial intelligence and a founding father of frame theory.

In the 1980s, expert systems began to be widely used in the

field of industrial control. In the 1990s, neural networks made remarkable achievements in speech recognition, computer vision, and natural language processing. In the 21st century, deep learning technology gradually emerged, leading the technical progress in the fields of speech recognition, image recognition and natural language processing.

3. Importance of the application of artificial intelligence in the edical field

3.1. Addressing the imbalance between supply and demand for medical care:

According to data released by the National Bureau of Statistics (NBS), as of the end of 2019, the total population of the mainland reached 14,000.05 million, of which 253.88 million, or 18.1 per cent, were aged 60 years and above. With the aging of the population, the imbalance in the healthcare supply chain is becoming more pronounced, and the healthcare industry is facing severe supply-side constraints. Against this backdrop, digital technology is widely regarded as the key to solving the imbalance between healthcare supply and demand.

3.2. Reduction in the rate of medical misdiagnosis:

According to the China Healthcare Industry Development Report, China's medical misdiagnosis rate was about 5% in 2019, and in the field of complex diseases, the misdiagnosis rate may even be as high as 30%. Artificial intelligence technology, especially deep learning algorithms, has shown outstanding advantages in the field of medical image analysis. Studies have pointed out that with the help of AI-assisted image diagnosis systems, the misdiagnosis rate can be reduced to 1-2%, significantly improving the accuracy of diagnosis.

3.3. Promoting scientific medical decision-making:

According to the report "Research on Medical Decision Support Systems in China", the application of AI technology in clinical decision support systems can assist doctors in analysing complex medical data and provide more scientific and rational treatment recommendations. By learning from a large number of clinical cases, AI systems are able to predict the development trend of diseases and assist in the formulation of personalised treatment plans, thereby improving treatment success rates and patient satisfaction.

4. Specific case studies - Meddu Cloud

With the rapid development of technology, Artificial Intelligence (AI) has become an important force driving innovation in the healthcare field. According to the latest industry analysis report, the global healthcare AI market is experiencing rapid growth, with the global healthcare AI market size exceeding USD 5 billion in 2022 and is expected to rise to USD 70 billion by 2032 at a CAGR of over 29%. The global AI smart healthcare market size is expected to reach US$365.67 billion by 2024.

Currently, MeduCloud serves and partners with over 300 hospitals through YiduCore, including over 70 tertiary hospitals. The company processes and analyses over 1.3 billion medical records from over 300 million patients. According to the prospectus, the proceeds from the capital raising will continue to be used to enhance core capabilities, including data processing technology and machine learning algorithms, and to improve solutions that respond to customer needs. It also plans further business expansion, including the development of new applications, solutions and related sales and marketing expenditures. Meditec Cloud further enriches its ecosystem through strategic partnerships, investments and acquisitions to enhance its competitiveness in the market.5

Through its core product, YiduCore, Meditec Cloud integrates medical data from hundreds of dispersed information systems. This data includes medical records, medical records, etc., covering a wide range of medical information. This product carries out in-depth processing and analysis of licensed large-scale multi-source heterogeneous medical data, builds real-world disease domain models, assists medical research, healthcare management, governmental public decision-making, innovative drug research and development, helps patients achieve intelligent disease management, improves medical efficiency and reduces costs through technology, accelerates the digital transformation of the industry, and realises a new ecology of data-intelligent green healthcare.

The data applications of MeduCloud are mainly reflected in the following aspects: firstly, for the research-driven hospital customer base, the YiduCore platform enables healthcare organisations to conveniently access, process and integrate various types of data, which in turn supports AI-based research and clinical applications; secondly, the platform provides healthcare solutions for life sciences companies to facilitate the development process of smart drugs; thirdly, it provides technological empowerment to doctors and hospitals through intelligent medical services, it provides technological empowerment for doctors and hospitals with a view to improving the overall quality of medical services; and finally, it provides intelligent monitoring and policy formulation solutions for regulators and policy makers to facilitate the scientific formulation and effective implementation of relevant policies.

5. Advantages and shortcomings of the Medical Cloud

5.1. Data governance and services

Relying on its self-developed new-generation data centre "YiduEywa", Meditec Cloud is committed to medical data governance and services. The platform realises efficient data governance, supports PB-level data processing, has more than 10,000 data governance dimensions, and can automatically complete the data governance process within three minutes, builds an open platform for hospitals to provide technical capability services, lays the foundation for value transformation, flexibly adapts to a variety of application scenarios, and provides support for clinical and healthcare management as well as one-stop scientific research.

5.2. Technological innovation and application

Mediadu Cloud has demonstrated excellent comprehensive innovation strength and application implementation capability in the field of medical big data, and has been ranked the top of the medical big data enterprise list for five consecutive years. Its success is attributed to its ability to transform "massive medical data" into "medical big data" in the healthcare industry, as well as its technology to mine and

realise the value of the data.

5.3. Hospital management support

Meditec Cloud has accumulated eight core advantages in the field of hospital management, including the provision of a high-quality data base, more than 3,000 healthcare business analysis indicators, the establishment of an all-round operation warning and reminder management closure, intelligent and efficient Q&A, a professional hospital management consulting team, and rich experience in digital transformation and refined operation and management, which provide solid support for the high-quality development of public hospitals.

Nonetheless, there are shortcomings in the company, such as insufficient data standardisation and high R&D costs, which have led to sustained losses. As a platform that aggregates data from many healthcare organisations, the problem of data standardisation in Meditec Cloud may stem from the diversity of data sources. The data come from different hospitals, clinics, laboratories, etc., and thus there is a problem of non-uniform data formats and coding standards. The lack of data standardisation may affect the accuracy and efficiency of data analysis, which in turn affects the quality of the data intelligence solutions provided by Meditec Cloud.

The following countermeasures can be taken to address these shortcomings:

Promoting standardisation:

We actively participate in industry standardisation organisations, take part in the formulation of industry standards, promote data standardisation in the field of healthcare informatisation, and facilitate the interoperability and sharing of healthcare data.

Data cleansing and integration:

Perform data cleansing and integration to clean, standardise and improve data quality and consistency of data in the Meddu Cloud. This requires the development of appropriate data cleansing rules and standardisation specifications.

Data exchange specifications:

To formulate a unified data exchange specification, specifying the data format, coding and transmission methods, so as to ensure that data exchange and sharing among different medical institutions can be carried out smoothly.

5.4. Data governance mechanisms

Establish a sound data governance mechanism, clarify data ownership, usage rights and responsibilities, and strengthen the management and supervision of the MeduCloud data.

5.5. Reducing technology costs

Reduce the cost of updating and maintaining smart medical technology through technological innovation and cooperation. Adopting open source technologies and establishing long-term partnerships with technology providers to ensure timely updating and maintenance of technologies.

6. Concluding remarks

The impact of AI on healthcare is positive and far-reaching, as it is revolutionising the traditional healthcare model, improving diagnostic accuracy, accelerating drug development and optimising the patient experience. However, it also faces challenges such as data privacy protection, algorithm transparency and interpretability. Therefore, the formulation of appropriate laws and regulations to protect personal privacy information and regulate the application scenarios of AI to ensure that the new technology truly benefits humanity within a legal and ethical framework is an urgent issue that needs to be addressed nowadays. As the technology continues to develop and the healthcare system gradually adapts, AI is expected to play an even more critical role in the future healthcare ecosystem.

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