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ARTIFICIAL INTELLIGENCE IN MEDICINE: NEW OPPORTUNITIES IN DIAGNOSIS AND TREATMENT

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Abstract: This article analyzes the application of artificial intelligence (AI) technologies in medicine, particularly their effectiveness in diagnostic and therapeutic processes. Based on globally recognized scientific studies and literature, the capabilities, advantages, and challenges of AI are presented. The impact of AI on medical ethics and its future prospects are also discussed.

Keywords: Artificial intelligence, diagnosis, medical technologies, algorithms, healthcare, digital medicine.

Relevance of the topic:

21st-century medicine is rapidly evolving and closely linked to modern technologies. One of the most critical and promising directions is the integration of artificial intelligence (AI) into the healthcare system. Today, AI technologies enable early disease detection, treatment planning, and even the execution of complex surgical procedures. Global research shows that with the help of AI, diagnostic accuracy can reach 90–95%. For example, algorithms developed by researchers at Stanford University (USA) have demonstrated higher accuracy than experienced dermatologists in detecting diseases such as skin cancer. Additionally, in Eric Topol's book "Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again", ways of strengthening, rather than losing, the human connection between doctor and patient with the help of AI are presented [5].

Artificial Intelligence: A New technological turn in Medicine

The application of AI technologies in medicine has radically transformed diagnostic and treatment processes in recent years. AI is primarily used to process large volumes of data, analyze them, and make accurate decisions. The main areas of AI application in medicine include diagnosis, treatment, monitoring, and healthcare management. For example, AI technologies demonstrate excellent results in the automatic analysis of radiological images using various software and devices. AI is also employed in drug discovery through scientifically based approaches. Worldwide, many hospitals and clinics are using AI for faster diagnosis and treatment management in practice.

AI capabilities in the diagnostic process:

AI has led to significant changes in medical diagnostics. AI systems in radiological imaging—such as X-rays, computed tomography (CT), and magnetic resonance imaging (MRI)—achieve high accuracy in disease detection. For instance, Google's AI program showed very successful results in detecting breast cancer. If AI identified the disease with 99% accuracy, physicians' accuracy was 88%. Moreover, AI-based image analysis technologies reduce human errors during

image interpretation, ensuring more accurate and faster diagnoses.

AI approaches in treatment processes:

Artificial intelligence plays a major role in medical treatment, particularly in designing personalized treatment plans. For example, personalized treatment methods are being developed using genomic data. These methods allow for the selection of medications and optimization of treatment methods based on an individual's genetic characteristics. Additionally, surgical procedures performed with the assistance of robotics are also improving through AI. For example, da Vinci robots enable the execution of complex surgical operations with even greater precision.

Advantages and efficiency indicators of AI:

AI technologies provide several advantages in medicine. First, they offer the ability to analyze medical images with high accuracy and speed. For example, AI diagnostic systems have achieved 95% accuracy in detecting bladder cancer [1]. Second, decision-making in medicine is accelerated with the help of AI, allowing for faster patient care. As a result, patients' survival rates increase. Third, AI systems enable effective management of medical services, improving the overall efficiency of healthcare systems. However, the widespread use of AI systems raises some challenges. Primarily, accepting AI decisions without physician verification can lead to errors and adverse consequences. Additionally, if incorrect data or faulty algorithms are used in AI systems, results may be inaccurate [6]. Privacy issues also require significant attention. The security of patient data must be ensured. Furthermore, from an ethical standpoint, AI systems are important when considering responsibility for human health, which traditionally lies with physicians.

Global experiences: AI in practice

Today, artificial intelligence is successfully applied in medical practice in several advanced countries. For example, in the USA, IBM's "Watson for Oncology" project provides recommendations for the diagnosis and treatment of oncological diseases. Watson, relying on its extensive medical database, analyzes the patient's condition and develops individualized treatment strategies [2]. Created in collaboration with the Memorial Sloan Kettering Cancer Center, this system assists physicians in clinical decision-making. Google Health developed an algorithm using AI to detect breast cancer. According to a study published in Nature journal in 2020, this system, compared to physicians in the USA and the UK, increased diagnostic accuracy and significantly reduced false positives and false negatives [3]. In the UK, the National Health Service (NHS) uses AI to analyze MRI and CT images [4]. This helps provide faster diagnoses and reduces waiting times. Additionally, DeepMind's AI algorithm for detecting retinopathy has shown high effectiveness in early-stage diagnosis of eye diseases. These experiences indicate that artificial intelligence is becoming an important tool not only in diagnostics but also in medical decision-making, treatment management, and healthcare system digitalization.

Conclusion:

Artificial intelligence opens new opportunities in healthcare. It optimizes diagnostic and treatment processes, but it is important to use it correctly and cautiously. In the future, AI may become an integral part of healthcare systems, but human values must be preserved.

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