THE USE OF THE LATEST COMPUTER TECHNOLOGY AND ARTIFICIAL INTELLIGENCE IN DIAGNOSTICS AND TREATMENT OF NEUROLOGICAL DISEASES IN CHILDREN

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Introduction

Neurological disorders in children are one of the most pressing issues in modern pediatrics. Disorders of the central and peripheral nervous system in children can have a long-term impact on the development of cognitive, motor, and emotional functions. According to the World Health Organization, approximately one in ten children worldwide suffers from various forms of neurological disorders.

The development of digital technologies, artificial intelligence, and bioinformatics in the 21st century has enabled medical science to reach a new level of diagnosis and treatment. The use of computer algorithms and intelligent systems in pediatric neurology allows for more accurate detection of pathologies, early prediction, and personalized therapeutic strategies.

The aim of the work is to investigate the significance and effectiveness of the latest computer technologies and artificial intelligence in the diagnosis and treatment of neurological diseases in children, and to determine the prospects for further development of these areas in pediatrics.

1. Epidemiology and significance of childhood neurological diseases

Neurological diseases are one of the leading causes of chronic childhood pathologies. According to statistics, they account for up to 20% of all childhood diseases. The most common neurological disorders in children include cerebral palsy, epilepsy, neurodegenerative disorders, developmental delays, autism, and various hereditary syndromes.

The nervous system of children is highly plastic, making early diagnosis crucial. Timely detection of neurological disorders allows for appropriate treatment and improved outcomes.

The problem is complicated by the fact that most neurological diseases have a complex etiology and require a multidisciplinary approach. Therefore, the introduction of computer and intelligent technologies is a prerequisite for modern neurological analysis.

2. Modern diagnostic methods

Diagnosis of children's neurological diseases is based on clinical, neurophysiological, and neuroimaging studies.

Among the most informative modern methods include:

• Magnetic resonance imaging (MRI), which allows for obtaining detailed images of brain structures and determining the extent of damage to the nervous tissue;

• Functional MRI (fMRI), which evaluates the activity of various brain regions during the performance of tasks;

• Electroencephalography (EEG), which records the bioelectric activity of the brain;

• Computed tomography (CT) – used in cases of trauma and congenital malformations;

• Neural network image analysis systems that automatically identify pathological changes.

The use of computer technologies allows you to combine data from various studies and form a single diagnostic picture. Machine learning algorithms can find correlations between symptoms, EEG data and structural changes on MRI, thereby increasing the accuracy of diagnosis.

3. The Role of Artificial Intelligence in Diagnostics

Artificial intelligence (AI) has become an integral part of medical diagnostics in recent years. Its application in pediatric neurology provides analysis of large data sets, including images, genetic information, and clinical indicators.

AI is capable of:

• automatically recognizing focal brain lesions;

• predicting the course of the disease;

• assessing the risks of complications;

• suggesting a probable diagnosis to the doctor based on statistical models.

Programs based on deep neural networks demonstrate accuracy comparable to that of experienced specialists.

For example, systems using the principles of "deep learning" are successfully used to diagnose epilepsy and autism based on brain activity patterns.

Thus, artificial intelligence becomes a reliable tool in the hands of a doctor, accelerating the diagnostic process and increasing its accuracy.

4. Modern approaches to treatment

Modern pediatric neurology is gradually moving towards personalized therapy, which is based on the individual characteristics of the child's body.

Artificial intelligence helps doctors to select the optimal combinations of drugs and procedures by analyzing genetic data, examination results, and the dynamics of the disease.

The most promising areas of treatment:

• Neurostimulation (electrical stimulation of the brain or spinal cord to restore lost functions);

• Robotic rehabilitation aimed at restoring motor skills and coordination of movements;

• Virtual reality is used to train attention, memory, and motor skills.;

• Neuro feedback (neurofeedback) — allows a child to control his own brain activity through computer interfaces.

The use of AI makes it possible to evaluate the effectiveness of therapy in real time and make necessary adjustments to the treatment program.

5. Telemedicine and digital monitoring

Digital technologies have significantly simplified the monitoring of patients with chronic neurological diseases.

Telemedicine provides remote interaction between a doctor and a patient, which is especially important for families living in remote regions.

Using mobile applications and wearable devices, it is possible to:

• monitor the parameters of sleep, activity and mood of a child;

• transmit data on seizures or changes in the condition;

• receive recommendations for therapy correction.

Such systems allow doctors to quickly respond to changes and prevent complications. In addition, telemedicine contributes to a more efficient use of medical resources.

6. Ethical and legal aspects of the use of technologies

The use of artificial intelligence and digital technologies in pediatric medicine requires strict adherence to ethical and legal norms.

The main priority is to protect the personal data of children and their families.

Medical institutions must ensure the confidentiality of information and the transparency of the algorithms' operation. The doctor must understand how the system reached a particular conclusion.

In addition, it is necessary to take into account moral aspects — it is unacceptable to make treatment decisions solely based on the recommendations of an algorithm without the involvement of a specialist.

7. Development prospects

In the future, the integration of artificial intelligence, bioinformatics and neuroscience will allow the creation of complex intelligent systems capable not only of diagnosing diseases, but also of forming individual recovery programs.

The main areas of development include:

• creation of a unified database on childhood neurological diseases;

• development of AI-based clinical decision support systems;

• use of genomic analysis for predicting disease predisposition;

• improvement of neurointerfaces that connect the brain and the computer.

These achievements will significantly improve the effectiveness of medical care for children with neurological disorders.

8. Conclusion

The introduction of the latest computer technologies and artificial intelligence in pediatric neurology has become an important milestone in the development of modern medicine.

These technologies not only facilitate the work of doctors, but also allow for the diagnosis of diseases in the early stages, when the probability of successful treatment is the highest.

Artificial intelligence is becoming a reliable assistant for specialists, capable of analyzing vast amounts of information, identifying hidden patterns, and offering effective solutions.

The future of pediatric neurology is a union of a doctor, technology, and science for the sake of a child's health.

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