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Artificial Intelligence in Medicine

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Artificial intelligence is a field of computer science that can analyze a large scope of medical data that is further used in the diagnosis, treatment, and prediction of any outcome in many clinical situations. The application of artificial intellectual methods has been studied and has revealed the potential practically in all branches of medicine.

It can be difficult for a doctor to correctly diagnose a disease, especially if he does not have too much practice or the specific case is far from his professional experience. Here, artificial intelligence can come to the rescue, having access to databases with thousands and millions of medical histories and other ordered information. With the help of machine learning algorithms, it classifies a specific case, quickly scans the scientific literature published over a certain period on the desired topic, examines the available similar cases and presents a treatment plan. Moreover, artificial intelligence will be able to provide an individualized approach, considering information about the patient's genetic characteristics, movement patterns collected by their wearable devices, previous medical history – and the entire history of life. Artificial intelligence will not probably replace the doctor, but has already become a useful tool, an assistant in the diagnosis and treatment. Here are some examples.

IBM Watson for Oncology. IBM Watson is a supercomputer that can answer questions formulated in a natural language. It has access to various data sources:

encyclopedias, databases of scientific articles, and anthologies of knowledge. Thanks to the huge computing power, after processing the sources, it gives the most accurate answer to the question. IBM Watson for Oncology is a program that uses the power of IBM Watson to determine the optimal evidence-based cancer treatment strategy. Before the launch of this program, hundreds of thousands of medical documents were uploaded to Watson for training, including 25,000 case studies, more than 300 medical journals, and more than 200 textbooks, with a total of about 15 million pages of text. It is understood that its database is constantly updated with new medical records [1].

NeuroLex.co. When people speak, they communicate the meaning of what is being said not only by words, but also by intonation, the intervals between words, speed, and volume of speech. It is known from psychiatric practice that psychotic disorders are usually accompanied by certain speech changes. Therefore, it is possible to teach neural networks to place correlations between speech patterns and diagnoses (based on existing clinical practice), thus making the process of establishing a diagnosis faster and more accurate [2].

The Human Diagnosis project (Human Dx) is an ambitious initiative of young doctors from San Francisco, combining, in their words, "the efforts of the collective mind" and machine learning. It is expected that there will be collected descriptions of symptoms, results of medical examinations, personal and family medical histories, indications of diagnostic devices, results of laboratory studies, etc. Based on all this, a fundamental data structure will be developed that can be accessed by any doctor, patient, researcher, or any other person, organization, device, or application. The short-term goal of the project is to aid in timely and correct diagnosis of diseases and prescribing treatment, as well as in medical education. The long-term goal is to radically improve the cost, availability and effectiveness of medical care worldwide [3].

Thousands of doctors and researchers dealing with genetic diseases all over the world use the Face2Gene computer program for preliminary diagnostics. This program can distinguish specific faces after "training" in several images of a specific person. The Face2Gene program, on the other hand, defines a pattern that is common for a group of people with a single syndrome. The establishment of this common denominator allows the program to create a composite characteristic of the averaged image that are correlated with disease. The more people enter data into Face2Gene, the more the system remembers facial features associated with any syndromes. 60 percent of clinical geneticists and genetic consultants worldwide use this technology. The mobile app automatically takes a photo of the patient, uploads this photo to the server, and analyzes the features of the patient within a few seconds to make a list of syndromes that correspond to the identified similarities. Each syndrome is accompanied by information from London medical databases, which store and update a collection of dysmorphic images. The app is designed to identify diseases primarily in children. Its use is free of charge, but it is assumed that it will be used exclusively by medical professionals and researchers. To diagnose a patient's genetic diseases, it is enough to upload one or more of their front-facing photos using web apps or apps for Android or iOS. Based on the results of comparing a foreign photo with the types of faces that are characteristic of certain genetic diseases, the program gives a list of the patient's probable diseases and shows the degree of probability of the disease on the scale – from low to high [4].

In addition to clinical practice, artificial intelligence is used in biomedical research. For example, a machine learning system can be used to test drug compatibility or to analyze genetic code. Deep Genomics is a project of a system that will allow you to study, predict and interpret how genetic variations

change important cellular processes, such as transcription, splicing, etc. Changes in these processes can lead to diseases, and therefore knowing the cause of the disease can make therapy more effective [4].

Currently, the focus of treatment has shifted from acute diseases to chronic ones. And chronic patients need to be constantly aware of their own health status. They are helped by wearable devices that allow you to monitor your heart rate, blood pressure, breathing, and other health indicators. According to the information received, these devices notify owners of actions that need to be performed now (take medicine, change the type of physical activity, etc.). The indicators taken by these devices can be transmitted directly to the doctor via a smartphone, so that the doctor always keeps hand on the pulse and can give recommendations on the course of changing indicators.

There are many different applications of artificial intelligence in medicine that can solve various clinical problems. There is strong evidence that medical artificial intelligence can play a vital role in helping clinicians deliver effective medical care in the 21st century.

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