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ARTIFICIAL INTELLIGENCE IN MEDICINE

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The healthcare industry is one of the fastest growing in the world. Scientists predict that by 2030, personalized medicine using an augmented artificial intelligence system will become a reality, and in another 5 years, the first hospitals without doctors will appear [1].

Today, the medical industry has formed a number of trends that affect not only the work of large corporations, insurance companies and clinics, but also the lives of all of us.

One of the key trends in medicine is the ever-increasing cost of patient care. There are several reasons for this: the rising cost of medicines, equipment; the increasing cost of medical services; changes in the number and intensity of services used (due to the fact that the disease was detected too late or the treatment was incorrectly determined, more visits to the doctor and more additional examinations are required) [2].

Investment companies and companies in the medical industry are interested in reducing the cost of treatment and services. How is this being realized?

Firstly, by introducing a personalised approach to treatment. This is an opportunity to improve the quality of treatment using several methods: monitoring the patient's condition, collecting data about the patient; doing remote examinations with devices that transmit the patient's condition; being able to create an individualised treatment plan for each patient; early diagnosis [3].

Secondly, more widespread introduction of generic drugs. Early diagnosis allows the use of commonly available, inexpensive drugs in treatment protocols, rather than specific and expensive ones. On the other hand, pharmaceutical companies conduct comprehensive clinical trials to bring new drugs to market. The research procedure is multi-staged; it takes several years and requires significant investments. Thus, generic drugs can be a solution that will help to reduce the costs for companies so as to bring new highly specialized drugs to the market.

Another important area is the use of support staff for patient consultations. This saves doctors' time. Nurses are involved in the initial assessment of the patient's condition, identifying anomalies in the diagnostic results [4]. Moreover, the development of treatment regimens and algorithms, the creation of

questionnaires allows non-medical personnel to determine the patient's condition and to decide whether he needs a doctor's consultation or not. The same algorithms enable the introduction of bots to handle initial requests from patients.

Artificial intelligence is used to identify at-risk patients. The doctor gives these patients priority attention. This saves a lot of time and minimises the possibility of doctor's error. For example, there are programmes for detecting melanoma [5].

Humanity regularly faces epidemics. Many people have heard about Ebola, malaria and other outbreaks of diseases that are transmitted both by insects and through water. The artificial intelligence system that allows to control and to predict epidemics is in the status of clinical trials, but it has already been used and is working in Africa now.

The information is collected by using drones. They actually catch mosquitoes, analyse their DNA and give a prediction of where and when the next outbreak will occur – after which the risk area is treated. Such systems make it possible to prevent uncontrolled outbreaks of epidemics.

Further development of artificial intelligence will lead to the use of augmented artificial intelligence systems. These systems open up new possibilities for us. For example, to classify MRI images at high speed without human intervention. Also, to create personalised medicine and effective treatment based on specific patient data – tests and reactions to chemicals. Such a service is predicted to be available for mass use by 2030.

By 2035, hospitals without doctors are expected to emerge. This is an example of autonomous artificial intelligence, where the system makes its own decisions. Yes, of course, doctors will still be needed, but, for some simple cases, the AI capabilities described above will be available.

When a person has diabetes, he has a fairly high risk of going blind. This disease is called retinopathy. A total of 1,367 images of the human retina were examined. Based on these data a system was created which allows determining the probability of the disease, its stage and also diagnosing it at an early stage. The current accuracy rate is 60 %. This is not an ideal figure, but it is based on public data. Such a system is an example of an assisted system. It helps the doctor to classify patients according to the risk of the disease, and he or she makes the final decision.

The system used was Google TensorFlow, which is based on the Convolutional Neural Network, OpenCV, languages – Python, JavaScript.

The next system is melanoma detection and classification of skin diseases. Google TensorFlow system was also used. It helps the doctor to decide on the treatment of a patient by automatically sorting out these images without human intervention. Initially, they used test data on the system learned how to make

decisions. Now, once a patient's image has been uploaded, it provides information and indicator of the likelihood of disease [6].

The technologies that were used in this case are: Convolutional Neural Network, OpenCV and the ResNet pre-trained model. The pre-trained model made it possible to speed up the learning process and reach an accuracy rate of 75–80 %. To do this, the database should contain at least 10–15 thousand images. The more images, the more correct the model is. Each model is tested and trained in several cycles. It is built, then, a new data set is loaded, it is trained and adjusted.

The development of modern medicine is inconceivable without the introduction of IT technology. Digital transformation is gradually engulfing all industries of the world, helping to solve the problems that stand in the way of their development. Current trends in healthcare have led to an increase in demand and, accordingly, to investment in the development of solutions using artificial intelligence and Data Science [7].

In general, working on projects in medicine is quite challenging, because in addition to developer's skills, knowledge in medicine and allied sciences is required. Therefore, continuous learning is a key skill for the development team member in medical projects.

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