JANUARY-FEBRUARY

2021

WARSAW, POLAND

SCIENTIFIC AND INTERNATIONAL CONFERENCE

SCIENTIFIC IDEAS OF YOUNG SCIENTISTS

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НАУЧНЫЕ ИДЕИ МОЛОДЫХ УЧЕНЫХ

ISBN 978-83-66401-69-3

Scientific ideas of young scientists / Pomysły naukowe młodych naukowców / Научные идеи молодых ученых

International scientific and practical conferences
January, 2021 Warsaw, Poland

Wydawca: Sp. z o.o. «Diamond trading tour»

Adres wydawcy i redakcji: 00-728 Warszawa, ul. S. Kierbedzia, 4 lok.103

DOI: http://doi.org/10.37057/P_6
Available at virtualconferences.press

PHILOLOGICAL SCIENCES

PSYCHOLOGICAL SCIENCES

RESEARCH OF METHODS OF APPLICATION OF NEUROINFORMATION NETWORKS IN MEDICINE

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Abstract: The article presents an analysis of the use of neural network technologies for medical diagnosis of various diseases, the purpose of which is to determine which areas of diagnosis of neural network technologies are the most effective. At the same time, the structure of artificial neural networks, learning algorithms and the accuracy of the functioning of artificial neural networks were considered. Analysis of the literature showed that the most optimal model of artificial neural networks for solving tasks of medical diagnosis, multilayer perceptron.

Keywords: neural networks, artificial neural networks, healthcare, medicine, medical diagnostics, mathematical modeling

One of the most relevant modern directions of medicine is the development of intelligent systems for the diagnosis and prediction of diseases and their application in practice [1]. The basis of these types of systems is based on various mathematical models and algorithms. Systems based on the mathematical apparatus of artificial neural networks (SNTs) are particularly effective in solving medical diagnostic and prediction problems. CNTs are mathematical models based on the principle of organization and operation of medical neural networks, as well as their software or hardware applications. CNT consists of elements called mathematical neurons, the mathematical neuron receives information, on the basis of which it has weight coefficients, performs calculations on it and transmits it to the next system. Connected and interconnected mathematical neurons form a neural network that can solve very complex problems. Several types of multi-layered perceptron are currently the most widely used ins. In this article, we will consider the use of CNTs in various fields of medicine, with particular emphasis on their architecture, teaching algorithms, and the accuracy of their performance. TV. Chashi and co-authors considered the possibility of predicting the progression of postipox disorders of the cardiovascular system in newborns using CNT in the field of cardiology. In this study, two three-layer networks were created, at the input of which the rtimi records of heart rate variability were given in the form of a sequence of RR interval values.

Particular attention is paid to the use of CNT in the diagnosis of coronary heart disease. A.G. Sboev and co-authors [2] showed that two latent multilayered perceptrons are the most optimal topology for the diagnosis of coronary heart disease. The training was performed using genetic optimization for the number of neurons in the latent layers. The accuracy of the diagnosis of coronary atherosclerosis and coronary heart disease was 96 and 94%, respectively. shows that the neural network model is higher than the accuracy.

The model structure used in this study consists of a multilayer architecture consisting of 13 input neurons, 13 latent neurons, and 1 output neuron. H. Moghaddasi as an activation function and others selected a sigmoid function using a multilayered perceptron trained using the Broyden – Fletcher – Goldfarb – Shanno (BFGS) algorithm as a neural network model for diagnosing cardiac ischemia. The accuracy of the model was 73.39%, with a sensitivity of 93.44% and a specificity of 28.34%. To increase the effectiveness of the diagnosis of coronary heart disease, Z. Arabasadi et al. [3] proposed a hybrid method that combined a genetic algorithm and CNT. Using this methodology, the authors of this study achieved an accuracy of 93.85%, while the sensitivity of the model was 97% and the specificity was 92%.

With the development of neural network technologies, new CNT architectures and new algorithms for their training have been developed. In 2006, in-depth training technologies were introduced for the networks. This approach became widespread only after 2012. Thus, in 2017, scientists A. Caliskan and M. Yuksel published a scientific article stating that deep neural networks can be used to diagnose coronary heart disease. In this study, the classification of diagnosed patients into two groups - “patient healthy” and “sick patient” classification was adopted. The network was trained in two phases. The

age and sex of the patient, as well as laboratory blood tests and ECG readings were used as training parameters. The neural network was trained in two data sets, in the first case the network classified patients with 87.6% accuracy, and in the second case with 89.7% accuracy.

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