DEVELOPMENT MECHANISMS OF DISTANCE EDUCATION IN MODERN CONDITIONS

Zokirov Mirzraxim Abdualiyevich
QDPI teacher

Toshpo'latova Karaimaxon Turg'unovna
Teacher of the "Special Sciences" department of Furqat Pedagogical College

Abstract

In this article, the essence of neural networks, their current development and their connection with fields such as medicine, neurophysiology, psychology and architecture. The need and methods of these neural networks are described and analyzed. Also, by discussing the benefits or negative aspects of these neural networks that they bring to our life, lifestyle, it is possible to come to the correct conclusion about these neural networks.

Keywords: ANN, MRI, neural network, medical, psychology, neurobiological, heuristic, synapses, BCIS

In general, neural networks are mathematical models of bioelectrical processes based on information transmission and processing in the central nervous system. In medical and psychological contexts, they are primarily used to develop models that enable predictions such as patient survival after a heart attack, return to work after occupational therapy for patients with musculoskeletal disorders, or psychological treatment outcomes. Currently, neural networks can successfully solve complex problems that were previously unsolvable using classical algorithms. Surprisingly, their first name dates back to the 1940s, when the work of McCullough, Pitts and Hebb was the first description of a mathematical model of a network, the concept of an artificial neuron. True, automatic classification based on the decision function implemented with this historical model is simple, but for several decades it was not possible to use multilayer structures, that is, the first deep learning algorithms, but for this solution is required. To the important problem of backscattering.

The intersection of neural networks with the fields of medicine, psychology, and neurophysiology is a fascinating field with enormous potential for revolutionary

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breakthroughs. The development of medical and psychological research led to the creation of complex theoretical models that describe the behavior of biological systems. The complexity of these structures leads to the need to use new methodologies that allow analyzing the received data and building models describing the observed phenomena. In medicine and psychology, neural networks can be used to diagnose, predict the course of a disease, improve procedures, and thus indirectly improve patient comfort during procedures. This is especially important due to the growing number of databases derived from medical and psychological devices.

nspired by neurobiological factors, ANNs have been studied mathematically and technically since the 1940s, which was impossible before the invention of the first computer. Later, ANN was developed and widely used. Neurons in an ANN are a large number of interconnected elements distributed throughout the network. An ANN has the ability to modify, adapt, and improve synaptic connections that are weighted or weakened by an active neuron's excitation or inhibition of a future neuron or interaction with another binary active element. Feedback in the system proves the adaptability and learning ability that makes the ANN capable of performing heuristic goal-directed information processing; it usually requires a sufficiently large number of neurons and communicates over an appropriate number of synapses. The ability of the nervous system to learn and adapt has also been used as a model for ANN performance; knowledge of neurobiology can inspire new systems and algorithms for machine learning and artificial intelligence in general. An ANN implements a functional representation of an input-output mapping, or classifier, capable of performing supervised, semi-supervised, or unsupervised learning on sometimes incomplete or informally defined tasks.

Neural networks are a promising tool in various fields of science. They are well used in economics, materials science, and perhaps currently in medicine, including neuroscience and psychology. There are different types of neural networks, they are mostly artificial and use some of the principles of biological nervous systems, but there are other types as well. Such networks often mimic the functioning of biological neurons; therefore, they are sometimes called artificial neural networks (ANNs). ANNs are suitable for generalization, self-organization, clustering, compression coding, coding, and many other tasks, including diagnosis, classification, and prediction.

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However, along with these promising features, neural networks and deep learning approaches also involve very important methodological advances that need to be addressed before wider clinical adoption. Such important areas of development, particularly important in the field of neurodegenerative diseases, include: the theoretical and experimental neuroscience implications that guide these deep learning approaches, the lack of site-specific bias in data, and patient identification and diagnostic considerations. , model interpretation and clinical feasibility. Furthermore, dealing with deterministic data and evaluating these approaches by incorporating multiple data methods and comparing them with models remain several open questions to be addressed in future deep learning development. If these methodological issues are carefully attended to, we can see the full impact of these paradigm-shifting methodologies, especially in diseases of the nervous system.

Both deep learning and neural networks have been shown to enhance the understanding, diagnosis and treatment of various diseases of the nervous system. Neural networks consist of interconnected layers of artificial neurons that send signals to each other, allowing them to learn a heterogeneous set of complex features from multidimensional data. Along with the ability to extract complex features from different data modalities such as image intensity, functional MRI data, molecular and genetic data, etc., deep learning has the ability to efficiently capture complex hierarchical patterns. In addition, neural networks can be very robust and allow solving some problems related to handling missing data or real-time prediction, which can be especially useful in online streaming data processing.

Neural networks are used for image recognition and analysis in medical imaging techniques such as MRI, CT, and X-rays. They help in early detection and diagnosis of various diseases, thereby improving patient outcomes. Neural networks are used to analyze complex medical data, including genetic information, patient history, and diagnostic tests, to aid in disease diagnosis, prognosis, and treatment planning. Neural networks also play an important role in accelerating drug discovery processes by predicting molecular interactions, identifying potential drug candidates, and optimizing drug design.

In psychology, neural networks are used in behavior analysis, that is, neural networks are used to analyze and interpret complex patterns of behavior, which helps to better understand cognitive processes, emotion recognition, and mental health disorders. Neural networks are used to develop personalized therapeutic

interventions and digital health solutions that meet individual patient needs, such as virtual therapy and mental health monitoring. Neural networks help simulate and understand neural networks within the brain, providing insights into neurocognitive mechanisms and brain-behavior relationships.

Neural networks in neurophysiology and engineering are brain-computer interfaces (BCIs): Neural networks are an integral part of BCI development, providing direct communication between the brain and external devices. This technology holds promise for helping individuals with motor disabilities and creating new paradigms of human-computer interaction. Neural networks are used to design and control neuroprosthetic devices that offer restored functionality to individuals with neurological disabilities, such as prosthetic limbs and cochlear implants. Neural network-based control systems are used in engineering fields to simulate and optimize neural control strategies for autonomous systems, robotics, and prosthetic devices.

Regarding future directions and challenges, the integration of neural networks in medicine, psychology, and neurophysiology offers great opportunities for engineering innovations, including advanced medical devices, neurotechnology, and human-machine interfaces. However, issues related to data privacy, ethical considerations, and interpretation of neural network models must be addressed to ensure responsible and effective deployment in these interdisciplinary domains.

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