ADVANTAGES OF BASIC PRINCIPLES OF NEURAL NETWORKS METHOD

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Abstract. Neural networks have many important properties, but the main one is the ability to learn. Training a neural network is primarily about changing the strength of synaptic connections between neurons. The following example clearly shows this. In Pavlov's classic experiment, a bell was rung before each dog was fed. The dog quickly learned to associate the ringing of the bell with food. This was due to increased synaptic connections between the parts of the brain responsible for hearing and the salivary glan A difficult and time-consuming part of the process of developing a neural network is training it. A neural network is required to "work" on tens of millions of input data sets in order for it to be able to correctly solve the given tasks. Andrey Kalinin and Grigory Bakunov associate the spread of neural networks with the emergence of various accelerated learning technologies.

Keywords: neural network , machine learning , recognize objects in images

Introduction: What is Neural Network Technology Neural networks: their application, work In the first half of 2016, the world heard about many developments in the field of neural networks - Google (a network player in the direction of AlphaGo), Microsoft (a number of image recognition services), MSQRD, Prisma startups and others demonstrated their algorithms. one of the areas of development of systems is artificial intelligence... The idea is to simulate as closely as possible the functioning of the human nervous system, that is, the ability to learn and correct errors. This is the main feature of any neural network - it is able to learn independently and act on the basis of previous experience, making fewer and fewer mistakes each time.

Systems for recognition and classification of objects in images oice interfaces for the Internet of Things systems for monitoring the quality of service in call centers problem detection systems (including maintenance time prediction), anomalies, cyber-physical threats intelligent security and monitoring systems replacing some of the functions of call center operators with bots video analysis systems self-learning systems that optimize the management of material flows or the location of objects (in warehouses, transport) intelligent, self-learning control systems for production processes and devices (including robotics)emergence of "on-the-fly" universal translation systems for conferences and personal use the emergence of technical support consultants or personal assistant bots for near- personal functions. Vlad Shershulsky, director of technology cooperation programs of Microsoft in Russia, notes that neural networks are now used everywhere: "For example, many large websites use them to make the response to user behavior more natural and useful for their audience. Neural networks form the basis of most modern speech recognition and synthesis systems, as well as image recognition and processing systems. They are used in some navigation systems, whether industrial robots or unmanned vehicles. Algorithms based on neural networks protect information systems from attacks by attackers and help identify illegal content on the network. A difficult and time-consuming part of the process of developing a neural network is training it.

A neural network is required to "work" on tens of millions of input data sets in order for it to be able to correctly solve the given tasks. Andrei Kalinin and Grigory Bakunov associate the spread of neural networks with the emergence of various accelerated learning technologies.

Machine learning algorithms are the next step in the automation of any processes, any software development. Therefore, the market will at least match the entire software market, if not surpass it, because it will be possible to create new intelligent solutions that were not available for old software, - continues Andrey Kalinin, head of Mail.ru search at Mail.Ru Group A neuron is like a function: it takes multiple inputs and returns one.The circle below represents an artificial neuron. It accepts 5 and returns 1. The input is the sum of the three synapses connected to the neuron (three arrows on the left) On the left side of the image we see the 2 input values (in green) and the offset (separated in brown).The input data can be a numeric representation of two different properties. For example, when creating a spam filter, they might mean having several words in CAPITAL LETTERS and the word "Viagra"The input values are multiplied by 7 and 3, which are called their "weights" (highlighted in blue) Now we add the obtained values with the offset and get a number, in our case 5 (marked in red). This is the input of our artificial neuron.

Neural networks are one of the areas of research in the field of artificial intelligence based on attempts to reproduce the human nervous system. That is: the ability of the nervous system to learn and correct errors, which allows us to model the work of the human brain, albeit crudely.or the human nervous system is a complex network of human structures that ensure the interdependent behavior of all body systems.A biological neuron is a specialized cell that structurally consists of a nucleus, a cell body, and processes. One of the main functions of a neuron is to transmit an electrochemical impulse through the neural network through existing connections with other neurons. In addition, each connection is characterized by a certain value called the strength of the synaptic connection. This value determines what happens when the electrochemical impulse is transferred to another neuron:

either it increases, or weakens, or remains unchanged.A biological neural network has a high degree of connectivity: one neuron can have several thousand connections with other neurons. However, this is an approximate value and it is different in each case. The transfer of impulses from one neuron to another causes a certain excitation of the entire neuron network. The magnitude of this excitation determines the response of the neural network to some input signal. For example, a person's meeting with an old acquaintance can cause a strong excitation of the neural network if some bright and pleasant life memories are associated with this acquaintance. In turn, the strong excitation of the neural network can lead to increased heart rate, frequent blinking of the eyes and other reactions. For the neural network, meeting a stranger is almost imperceptible and therefore does not cause any strong reaction.A very simplified model of a biological neural network can be given below Each neuron consists of a cell body that contains a nucleus. Many short fibers called dendrites branch from the cell body. Long dendrites are called axons. Axons extend for great distances, much higher than shown in the figure. Axons are typically 1 cm long (which is 100 times the diameter of the cell body), but can be up to 1 meter long. Neural networks are a mathematical model built on the principles of bionic neural networks. Familiarity with this phenomenon should begin with the concept of a multilayer perceptron as the first embodiment of this system as a computer model. For such an important breakthrough in the development of neural networks, the term proposed by Google is inceptionism - apicture created by artificial intelligence and characterized byextreme psychedelicism in the best traditions. A neural network mimics not only the activity, but also the structure of the human nervous system. Such a network consists of a large number of individual computing elements ("neurons"). In most cases, each "neuron" refers to a specific layer of the network. Input data is processed sequentially at all layers of the network. The parameters of each "neuron" can change depending on the results obtained on previous sets of input data, thereby changing the order of the entire system. All tasks that neural networks can solve are related to learning in some way.

The main areas of application of neural networks include forecasting, decision making, pattern recognition, optimization, data analysis.Vlad Shershulsky, director of Microsoft's technology cooperation programs in Russia, notes that neural networks are now widely used: "For example, many large Internet sites use them to make reactions to user behavior more natural and useful for their audience. Neural networks form the basis of many modern systems for speech recognition and synthesis, as well as image recognition and processing. They are used in some navigation systems, be it industrial robots or self-driving cars. Algorithms based on neural networks protect information systems from malicious attacks and help identify illegal content on the network. The main thing that neural networks do for humans. to save him from making unnecessary decisions. As such, they can be used almost anywhere where very non-intellectual decisions are made by a living person. It is this skill that will be used in the next five years, replacing human decisions with a simple automaton. A difficult and time-consuming part of the process of developing an Iranian network is training it. A neural network is required to "work" on tens of millions of input data sets in order to correctly solve set tasks. Andrey Kalinin and Grigory Bakunov associate the spread of neural networks with the emergence of various accelerated learning technologies. "Machine learning algorithms are the next step in the automation of any process, in the development of any technology. software... Therefore, the market will at least correspond to the entire software market, rather than surpass it, because it is possible to create new smart solutions that are not available for old software will be," continues Andrey Kalinin, Head of Mail.ru Search at Mail.Ru Group Neural network is the so-called computing systems, which have the ability to self-learn and gradually increase performance. They are used to solve problems that are not amenable to logic programming:Machine learning is a type of artificial intelligence. Its specialty is step-by-step learning from millions of similar tasks In robotics, the system is used to create many algorithms for the iron "brains" of automatic systems Architects computer systems to find one of the solutions to the problem of parallel computing in neural networks

There are many other options for implementation: solving purely mathematical problems, computer modeling of natural intelligence, The main elements of such a network are Artificial neurons are elementary, interconnected units A synapse is a connection between neurons that serves to send and receive information A signal is a transmitted information. One of the most popular types of neural networks is the so-called convolutional neural network, which has been proven effective in visual pattern recognition (images and videos), recommendation systems, and natural language processing They are perfectly scalable and can be used to detect any high-resolution pattern They use volumetric (three-dimensional) neurons. Neurons within a layer are connected only by small areas called receptive fields;

Neurons of adjacent layers are connected by the mechanism of spatial localization. Stacking many such layers yields nonlinear filters that respond to more and more pixels Each filter expands to cover the entire field of view. These units are repeated, share existing parameters and form a map. Thus, all neurons of a certain convolutional layer begin to respond to the same object (within a certain response region. The practical application of the theory of machine learning became possible only today due to the advent of relatively cheap and at the same time powerful "hardware". However, theoretical research on this topic dates back more than a decade Blocks in the network can take only two values to describe their state: 1 and -1. Each pair of value units tells about the possibility or impossibility of connecting graph nodes;

Updating a single node in an artificial neuron modeling graph can be done asynchronously or synchronously. In the first case, only one block is updated, which can be chosen randomly. In the second case, all blocks are updated simultaneously The network is characterized by a state called "energy". Network updates are always performed at maximum energy values The rules for training a network are similar to the mechanisms of the human mind. New data can be connected using old data (local rule) or without referring to old samples additional rule. Neural networks are the best that humanity has in the way of artificial intelligence today. They are used almost

everywhere: autopilots in airplanes and cars, fraud detection programs for credit cards, mastering the game of go (a logic board game), and more. Neural networks are one of the areas of scientific research in the field of creating artificial intelligence (AI), which is based on the desire to imitate the human nervous system. Including its (nervous system) ability to correct errors and self-learn. All this should allow you to imitate the work of the human brain, even if it is a little rough A biological neuron is a specialized cell consisting of a nucleus, a body, and processes, and it is closely connected with thousands of other neurons. Through this communication, electrochemical impulses are periodically transmitted, bringing the entire neural network to a state of excitement or, conversely, to calmness. For example, some pleasant and at the same time exciting event (meeting a loved one, winning a competition, etc.) creates an electrochemical impulse in the neural network located in our head, which causes it to be excited. As a result, the neural network in our brain transmits its excitement to other parts of our body and causes the heart rate to increase, the eyes to blink more often.

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