Innovative: International Multi-disciplinary Journal of Applied Technology
(ISSN 2995-486X) VOLUME 02 ISSUE 03, 2024

Analysis of Human Neural Cells Using the Example of Robotics (Bioelectronics)

Zhamolova Gulbanbegim Muzaffar kizi
Associate Professor of TUIT Karshi branch

Abstract:

A neural network is a complex mathematical model that simulates the work of neurons in the human brain and is capable of processing information previously inaccessible to computers. Each neuron connected to the network processes the input signals and transmits them. Usually, a neural network consists of three levels: input, hidden, and output. The input layer receives data that is transmitted to the input of the neural network. The hidden layers process this data and transmit it to the output layer, which outputs the result of the network operation.

Keywords: *Neural networks, cognitive neural network, dendrite, Axon, soma (body), cells, synaptic connections, impulses, signals, artificial intelligence.*

Introduction. Robotics is the science that studies the design, creation and control of robots that can perform various tasks. In recent years, the development of neural networks has significantly improved the capabilities of autonomous control and training of robots, which has made them more efficient and adaptive to environmental conditions.

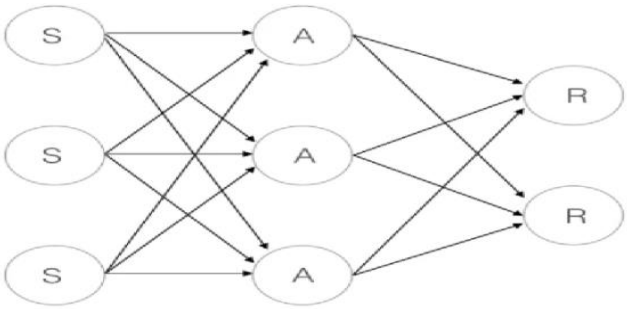
A neural network is a mathematical model that works according to the principles of the nervous system of living organisms, including humans. Its main purpose is to solve intellectual problems. That is, those that do not have an initially set algorithm of actions and a predicted result. The main feature of neural networks is the ability to learn. They can learn both under human control and independently, applying previously gained experience.

LITERATURE ANALYSIS. Science has reached the point of practical implementation of neural networks in our real life. There are many neural networks such as Midjourney, Hugging Face, Leia PixConverter and others. Every week, more and more new neural networks appear that provide unique opportunities. It doesn't make sense to write all their names, because everything changes very quickly.

One example of the application of neural networks in robotics is the autonomous control of robots. To do this, it is necessary to use sensors and cameras that collect data about the environment, and then transfer this data to a neural network. The neural network processes the data and makes a decision about controlling the robot, which allows it to act independently in various situati

The demand for neural networks in machine learning and artificial intelligence is that they allow a computer to learn from data and get results that are even better than the results obtained from a human. For example, neural networks learn from impressive amounts of data, which allows them to find patterns and make predictions based on this data. In addition, they adapt to changing conditions and improve performance over time.

RESEARCH METHODOLOGY. Neural networks solve problems that were traditionally solved only with the help of human intelligence, but are now solved automatically. Increase productivity and accuracy of work in industries and improve people's living standards.



1-Fig. Neural Network Architecture

Types of neural networks

There are types of neural networks, each of which is aimed at solving a specific task.

The first common type is fully connected neural networks (FFNs). In this case, each neuron in one word connects to the neurons in the next layer.

Another type is convolutional neural networks (CNNs), which process images using filters to extract features.

Repetitive neural networks (RNNs) work with sequential information such as audio signals or texts.

Generative Adversarial Networks (Gan) is used to create new data that can actually be extracted.

Auto encoders are used to reduce data size and compress data.

There are also special networks for sound and text processing. For example, repetitive neural networks (LSTMs) with long-term short-term memory for working with repetitive networks with gru cells for processing speech information and words.

Each type of neural network has its advantages and disadvantages, and the choice of a specific type depends on the task at hand. Therefore, in order to obtain results, it is important to carefully study the characteristics of each species and choose the right one for a specific task.

Amazon Web Services (AWS) is a cloud platform that provides data storage, processing and analysis services, including deep learning services. AWS cloud architecture allows developers and researchers to quickly create, deploy, and expand neural network learning resources.

AWS provides deep learning services including Amazon SageMaker, Amazon Elastic Inference and Amazon EC2.

Amazon Pagemaker is a managed machine learning service that provides tools for training, configuring, debugging, and installing neural networks.

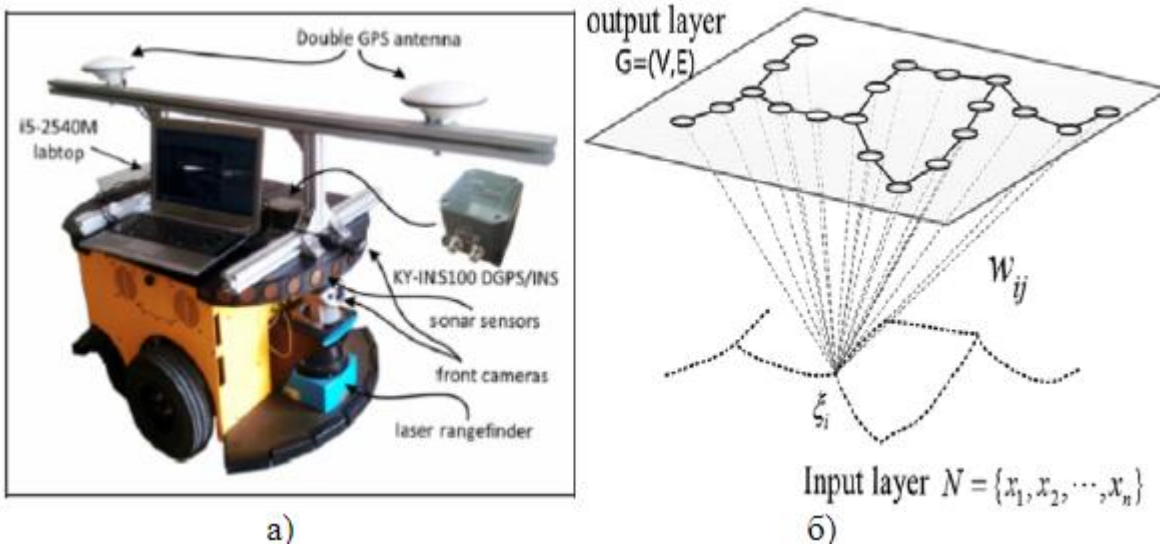
Amazon Elastic inference is a service that speeds up neural network training using GPU summary without having to buy your own GPUs.

Amazon EC2 computing resources used to train neural networks in the cloud.

Using neural networks to write articles is a technological breakthrough in content marketing that opens up new opportunities for content creation. Neural networks can automate and simplify the process of writing articles, making content creation faster and more efficient. This gives competitors an advantage because companies can get more profitable content in the short term.

DISCUSSION AND RESULTS. It can be concluded that the use of neural networks for writing articles is part of modern content marketing. Using a neural network improves the quality and efficiency of content creation, saves time and resources. However, it is important to consider the difficulties and risks in order to successfully use neural networks to create content.

2-Fig. A robot used for experiments (a) and displaying sensory information in a route map based on growing neural gas (b)



а) б)

Neural networks allow robots to learn from examples and experience. Using the method of error back propagation, they can independently adjust their actions and become more effective in their tasks.

One of the areas where neural networks are successfully used is computer vision. Thanks to this technology, robots can recognize and classify objects in images with high accuracy. This allows them to perform tasks related to searching and sorting items, as well as navigating complex spaces.

However, despite all the advantages of neural networks, they still have their limitations. For example, complex tasks require large computing resources, as well as a large amount of data for training. There is also the problem of interpreting decisions made by neural networks, which may make it difficult to apply them in some areas.

Advantages of neural networks in robotics:

- ✓ Adaptability to changing conditions
- ✓ High accuracy of task execution
- ✓ The ability to learn from examples and experience

Limitations of neural networks in robotics:

- ✓ Require large computing resources

- ✓ Require a large amount of data for training
- ✓ The problem of interpreting decisions made

The collaboration between neural networks and robotics makes it possible to create intelligent robots capable of interacting with the outside world and making decisions based on the information received.

For example, neural networks can be used to recognize images and objects in real time. This allows the robot to identify and classify objects, as well as make decisions based on this information.

Neural networks can also help robots interact with humans. They can be trained to recognize and interpret human gestures, facial expressions, and speech. This allows robots to communicate effectively with people and perform various tasks together with them.

- ✓ Improvement of automation processes
- ✓ Creation of intelligent robots

The architecture of neural networks in robotics and autonomous systems.

The first layer in the architecture of neural networks in robotics and autonomous systems is the input layer. On this layer, data from sensors or other input sources is fed into the neural network for further processing. This layer plays the role of an information transmitter and sets the initial values of the input neurons.

The next layer in the architecture of neural networks is the hidden layer. This layer consists of neurons that perform intermediate calculations and enrich the information transmitted from the input layer to the output layer. There may be several layers and their number may vary, depending on the tasks and requirements of a particular system.

The output layer is the last layer in the neural network architecture. This layer processes the information received from the hidden layer and provides an answer or solution corresponding to the task of robotics or an autonomous system. For example, it may be a decision to move or perform certain actions.

The central nervous system has a cellular structure. The unit of this system is a nerve cell or neuron. The neuron has the following basic properties:

1) participates in metabolism and dissipates energy. It changes its internal state over time, reacts to input signals and generates output effects, and therefore is an active dynamic system;
2) has many synapses – contacts for transmitting information;
3) the neuron interacts by exchanging electrochemical signals of two types: electrotonic (with attenuation) and nerve impulses (spikes) propagating without attenuation.

Neural network technologies are algorithms that simulate the activity of the biological brain with artificial structures made of formal neurons.

Let's consider the generalized structure of a nerve cell to understand the terms used in describing artificial neurons.

The human cerebral cortex is a surface formed by neurons, 2 to 3 mm thick with an area of about 2200 〖cm^2. The cerebral cortex contains about 10-11 neurons, which is approximately equal to the number of stars in the Milky Way. Each neuron is connected to 〖10〗^3 - 〖10〗^4 other neurons. In general, the human brain contains approximately 10-14 to 10-15 interconnections.

Conclusion. In fact, even a humanoid robot or humanoid robots cannot perform any task unless they have intelligence. The fact that the brain can perform the function of a "central processor" for a

person to perform various tasks has also proven itself from this article. At work, it is natural to wonder who performs this function. Iron Man performs the task offline with artificial intelligence through a mechanical device. However, the machine learning algorithm is used when making the most important decisions.

РЕКОМЕНДАЦИИ.

1. Жамолова Гулбанбегим Музаффар кизи– совершенствование нейронных сетей у человека на примере робототехники https://infocom.uz/raqamli-iqtisodiyot-ilmiy-elektron-jurnali-6-son-2024-yil-aprel/
2. Tarek Najjar, Osamu Hasegawa. Self-organizing incremental neural network (SOINN) as a mechanism for motor babbling and sensory-motor learning in developmental robotics. - Proceedings of the 12th international conference on Artificial Neural Networks: advances in computational intelligence WANN'13 - Volume Part I, Springer-Verlag 2013. – Pp. 321-330.
3. Luiza Mici, German I. Parisi, Stefan Wermter. An Incremental SelfOrganizing Architecture for Sensorimotor Learning and Prediction. - IEEE Transactions on Cognitive and Developmental Systems, doi:10.1109/TCDS.2018.2832844 - Apr 2018.
4. Вагин В.Н., Ганишев В.А. Кластеризация пользователей по голосу с помощью улучшенных самоорганизующихся растущих нейронных сетей. // Программные продукты и системы, 3 (111), 2015.- С. 136-142.
5. Гаврилов А.В., Канглер В.М. Нейроморфные технологии: состояние и перспективы развития. – Материалы VII Всероссийской научнотехнической конференции «Робототехника и искусственный интеллект» РИИ-2015, Железногорск, СФУ, 2015. – С. 148-154.
6. Ширяев, В.И. Финансовые рынки: Нейронные сети, хаос и нелинейная динамика / В.И. Ширяев. - М.: КД Либроком, 2016. - 232 с.
7. Галушкин, А.И. Нейронные сети: история развития теории: Учебное пособие для вузов. / А.И. Галушкин, Я.З. Цыпкин. - М.: Альянс, 2015. -840 с