

Study The Stages of Development of Artificial Intelligence

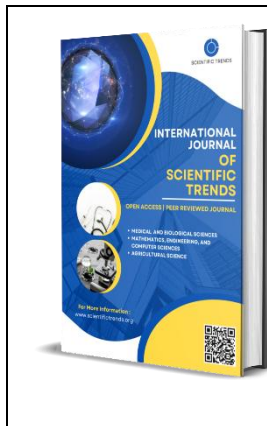
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Abstract

This article provides information on the general classification and structure of artificial neural networks and the tasks they solve. The areas where artificial neural networks are used and areas of their application were also discussed. At the same time, in today's advanced technology era, artificial intelligence and neural network technologies occupy an important place in the life of society. Artificial neural networks have been studied as solutions to complex problems where traditional algorithmic solutions are inefficient or impossible.

Keywords: Artificial neuron, artificial intelligence, machine learning, artificial superintelligence, intellectual activity.

Introduction

In today's advanced technology era, artificial intelligence and neural network technologies have an important place in the life of society. Artificial neural networks are actively used to solve complex problems when traditional algorithmic solutions are ineffective or impossible. The capabilities of modern computers allow to perform various calculations at a speed that is tens of orders of magnitude higher than the capabilities of the human brain. However, a number of non-computational tasks, even trivial to humans, remain too challenging for computer technology. A person's ability to store information associatively, to learn, summarize and process information taking into account the context remains unmatched even by modern supercomputers. AI is a branch of computer technology that focuses on making machines do intelligent things, that is, learn and solve problems similar to the natural intelligence of humans and animals. In AI, an intelligent agent receives information from the environment, performs calculations to decide how to act to achieve a goal, and performs autonomous actions. AI can improve its performance by learning. Artificial intelligence can be traced back to the 1940s, during World War II, when Alan Turing, a British mathematician and computer scientist, created a code-breaking machine called the "bombe" at Bletchley Park in Great Britain, which deciphered the German Enigma code.

Materials and Methods

The goal of designing artificial neural networks is to build a computational structure or algorithm that works according to the principles of natural intelligence. The following characteristics of neural networks can be included in the main ones.

1. Neural networks, similar to human and animal brains, are made of many simple elements that perform elementary actions and are interconnected by various connections.

2. Neural networks are able to improve (learn or adapt) their work using examples.

3. The neural network solution to the problem does not require the developer to create an algorithm for solving the problem and programming it. Neural networks typically use examples of "correct" cases to generate a method for solving a problem. At the same time, the network can detect hidden patterns in the task that are unknown to the developer.

Artificial intelligence (AI) is a modern field of computer science that studies the problems of creating algorithms and software that can think like humans and imitate their mental activity. Programs built on the basis of algorithms created for artificial intelligence can summarize information and draw conclusions using accumulated experience and samples, identify connections between information, and be trained based on the experience gained. Artificial intelligence systems can never replace humans, but they can increase their capabilities.

There are basically two main concepts in artificial intelligence systems:

1. Neural networks

2. Machine learning

Neural network, in essence, represents a mathematical model that reflects the activity of a human biological neural network in a reduced form, and the implementation of a mathematical model as a program. And machine learning is a set of special algorithms, which show the basis of the property of neural networks - the ability to self-learn based on data from experiments.

The more data arrays available for neural training, the easier it is for the training algorithms to identify connections and patterns between the data, while the results are closer to the expected values. will be close. There are several types of artificial intelligence, among which three main categories can be distinguished:

Narrow artificial intelligence (artificial narrow intelligence, ANI). It is a special software-hardware complex focused on a specific field. For example, a computer program can beat a chess champion, but that program can only do so much.

General artificial intelligence (artificial general intelligence, AGI). Artificial intelligence of this category consists of a human-like software and hardware complex, that is, it can perform tasks that a human can perform. General artificial intelligence is the ability to copy the ability of human thinking, it performs tasks such as obtaining data, extracting the necessary information from the flow of data, comparing different solutions to a problem, learning quickly, using accumulated experience. Artificial superintelligence (ASI). This category of artificial intelligence is a software-hardware complex that surpasses human intelligence in almost all areas, including scientific inventions, general knowledge, and social skills. Currently, humanity is successfully using elements of artificial intelligence in various fields:

- ✓ aware of various obstacles in his way and action against them
- ✓ self-driving (autopilot) cars
- ✓ in development;
- ✓ in the development of unmanned aerial vehicles that move independently along a given route;
- ✓ in navigators that determine the route using a voice command;
- ✓ in the application of spam filters used in e-mail sorting;
- ✓ in translator programs;

✓ in text, voice and video recognition systems, text to voice message

✓ widely used in reflective programs and other directions.

When it comes to artificial intelligence, we need to have a good understanding of concepts like artificial intelligence, machine learning, and artificial neural networks. At the same time, it is necessary to talk about how these terms are related to each other.

Artificial intelligence (artificial intelligence, AI). Artificial intelligence is the science that deals with the technology of creating intelligent machines, implemented in the form of software that can run on supercomputers, personal computers, smartphones or other computing devices. Artificial intelligence in a word -

it is a complex of hardware and software. Artificial intelligence systems can perform some creative human functions in addition to computational tasks.

Machine learning is a branch of artificial intelligence that studies different methods of building learning algorithms. Learning algorithms are algorithms that change (learn) depending on the input data and the final results. Machine learning is a very broad field of knowledge. Because if we interpret the concept of "teaching" in different ways, we can get interesting results every time. However,

Among the many paradigms and approaches of machine learning, artificial neural networks stand out as a very interesting direction. Artificial neural networks (ANN) are simplified models of biological neural networks of the human brain.

Currently, superiority among the countries of the world is not determined by the area and natural resources of the countries. Now the superiority in all fields is determined by the level of education and the amount of knowledge accumulated in society. In the future, which country is creating new knowledge and. if it takes the first place in the development, that country will flourish. The main role in this is occupied by new IT, and in it - the methods and tools of artificial intelligence. To get an idea of the main technologies of artificial intelligence, it is necessary to study how important concepts of artificial intelligence are applied to software solutions. The programs provide an opportunity to clearly construct the description of various processes. Their structure reflects the structure of the problems to be solved.

Artificial intelligence means voluntary biological, artificial or formal systems with the ability to manifest action in the target direction. Artificial or formal systems communicate, gather knowledge, perceive, teach, understand, adapt, etc. takes over. Artificial intelligence is making computing machines (HMs) smarter than humans the science of concepts that enable the fulfillment of their visible aspects. What is the human mind? Does he have the ability to think, acquire and apply knowledge? Does he have the ability to share ideas and work with them?

Obviously, all these abilities are part of intelligence. But this word cannot be defined in a simple sense. Because intelligence is a combination of knowledge in the field of information processing and presentation [1, 6].

The main problem of artificial intelligence is to make calculations more useful and to understand the principles behind intelligence. Since one of the main challenges is to make computers more useful, how can computer scientists and engineers help them solve the difficult problems of artificial intelligence? They should know that it is possible. Beginning of research in artificial intelligence systems (late 1950s) Newell, Simon, and Shaw explore different problem solving processes connected with their work. The core of their work were programs designed to prove

theorems in calculus. These studies initiated the first stage of research in the field of artificial intelligence systems. Also, during this stage, various games, puzzles and mathematical problems were considered as a research area. In describing their program, Newell and Simon noted that their program modeled human thinking. In the early 1970s, they published a lot of similar data and proposed a general way to program thinking. While Newell and Simon's work attracted much attention, a mathematical and symbolic approach to problem solving in AI systems research was developed by a group of researchers at the Massachusetts Institute of Technology, Stanford University, and the Stanford Research Institute.

Robinson's method of resolutions has had a great impact on research in the field of artificial intelligence systems. This method is based on the proof of theorems in the logic of predicates and is considered the perfect method of proof. By the end of the 1960s, efforts were made to use research in real problem environments, such as various games, puzzles, and mathematical problems, rather than in artificial environments. The study of the operation of artificial intelligence systems in real environments led to the issue of creating an integrated robot. Conducting such work can be called the second stage of research on artificial intelligence systems. In the mid-1970s, robots working in laboratory conditions were created at Stanford University, the Stanford Research Institute, and several other places. Conducting such experiments required solving a number of problems. Such problems include knowledge representation, visual perception, and natural language communication with robots. These problems set more clearly expressed tasks before the researchers. This period was the third stage of research of artificial intelligence systems. Its characteristic feature was the creation of human-machine systems that combine human intelligence and the capabilities of technology, rather than an alternative working system that solves the problem set before the researchers in a real environment.

The history of AI can be divided into three stages:

1950s–1970s, Neural Networks (NN): During this period, neural networks, also called artificial neural networks (ANNs), were developed based on the human brain that mimic human biological neural networks. A NN usually has three layers: an input layer, a hidden layer, and an output layer. To use NN, you need to train the NN with a large amount of data. After training, NN can be used to predict results for unseen data. During this period, NNs attracted a lot of attention. After the 1970s, when AIs failed to deliver on their promise, funding and research activities were severely curtailed, known as the AI boom. It was called the winter of AI.

1980s–2010s, machine learning (ML): This is the era when machine learning flourished. ML is a subset of AI, consisting of a set of mathematical algorithms that can automatically analyze data. Classical ML can be divided into supervised learning and unsupervised learning. Examples of supervised learning include speech recognition and image recognition. Examples of unsupervised learning include customer segmentation, defect detection, and fraud detection. Classic ML algorithms are support vector machine (SVM), K-means clustering, decision tree, naive Bayes, etc.

2010s–present, Deep Learning (DL): This is the era in which Deep Learning (DL) was developed. DL is a special type of neural network with several hidden layers. This is only possible with increased computing power, especially graphics processing units (GPUs) and improved algorithms. DL is a subset of ML. DL has so far outperformed many other algorithms on large datasets. But is DL hype or reality? It has to be seen.

AI is often confused with data science, big data, and data mining. The figure below shows the relationship between AI, machine learning, deep learning, data science, and mathematics. Both mathematics and data science are related to AI, but different from artificial intelligence. Data science mainly focuses on data which includes big data and data mining. Data science can use machine learning and deep learning to process data.

AI is already widely used in many aspects of our lives. Personal assistants such as Amazon's Alexa, iPhone Siri, Microsoft Cortana, Google Assistant and the most popular ChatGPT rely on AI.

Online entertainment services like Spotify and Netflix also rely on AI to figure out what you might like and recommend songs and movies. Other services such as Google, Facebook, Amazon and eBay analyze your online activity to deliver targeted ads. For example, a friend of mine once searched for Arduino boards during the day at work, and in the evening, when he got home, no matter what websites he visited, there were ads for Arduino boards!

Results and Discussions

In the automotive industry, driverless cars use AI to recognize objects, roads, pedestrians, and traffic signs. One of the best examples is Tesla's driverless cars. Tesla is making extensive use of AI systems in its self-driving cars. The financial industry uses AI to detect fraud and predict future growth. Agriculture is also turning to AI for healthy crops, pest control, and monitoring of soil and growing conditions. In healthcare, researchers at Google Health and Imperial College London have developed an algorithm that outperforms six human radiologists in reading mammograms to detect breast cancer.

Recently, the most popular AI application is ChatGPT, which uses natural speech processing (NLP), developed by OpenAI. As shown in the figure below, OpenAI was the market leader in 2022, invested \$1 billion, and ChatGPT has accumulated more than 266 million users since its launch in November 2022.

AI deep learning is inspired by the human brain, where the main part is neural networks. The concept of neural networks was first developed by the American neuro-physiologist Warren McCulloch and the American logician Walter Pitts in 1943. A biological neural network is a network of interconnected neurons. A biological neuron usually consists of a cell body, dendrites, and an axon. Biological neural network We can see the artificial neural network in the picture below. For reference, the human brain has 100 billion neurons and 1000 trillion synapses in the entire brain, and the most complex neural network, ResNet-152, has 60 million synapses. The human brain has approximately 10,000,000 times more synapses than artificial neural networks.

Currently, there is a stable direction of intellectualization of computers and its software. The main functions of future computers are to solve problems of a more non-computational nature, i.e. logical inference. It is aimed at solving the problems of output, knowledge base management, intellectual interface support and other issues. Intellectualization of computers requires special hardware (for example, neurocomputers) and software (Expert systems, knowledge base, problem solvers, etc.) is done at the expense of creation. The concept of "artificial intelligence system" can be defined as follows. A system is intellectual if three basic functions are implemented in it:

1. Knowledge presentation and processing function. The artificial intelligence system should be able to collect knowledge about the surrounding environment, classify and evaluate them in terms of pragmatics and non-contradictions, determine the processes of receiving new knowledge, and

new knowledge with the knowledge stored in the database. should determine the connections between them.

2. Reflection function. The artificial intelligence system should create new knowledge by means of logical conclusion and demonstrate the mechanism of legality in the accumulated knowledge, obtain generalized knowledge based on individual (personal) knowledge and logically plan its activities.

3. Communication function. The artificial intelligence system communicates with a person in a language close to him and receives information from channels analogous to the reception of the surrounding environment by a person (primarily visual and audio), "for himself" or something know how to formulate an explanation of personal activity at the person's request (i.e., answer questions such as "How did I do this?"), to the person in his memory. It includes the help of stored knowledge and the logical means of reasoning.

In my conclusion, all human behavior is based on neural networks. It is the function of neural networks to sense reflexes, senses, vision, speak, run, and all other senses. Neural networks process information, store in memory, work in the nervous system, receive impulses plays an important role in making and sending. For the most part, we would probably say that there has been a tremendous improvement in every branch of the life, therefore everybody should keep up with the cutting-edge technology devices and their functions as well.

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