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APPLYING OF ARTIFICIAL INTELLIGENCE IN THE TEXTILE INDUSTRY AS FACTOR OF INNOVATIVE DEVELOPMENT OF THE BRANCH

ПРИМЕНЕНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ТЕКСТИЛЬНОЙ ПРОМЫШЛЕННОСТИ КАК ФАКТОР ИННОВАЦИОННОГО РАЗВИТИЯ ОТРАСЛИ

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Abstract. In the article, the authors carried out a theoretical analysis of the practical applications of artificial intelligence in various fields.

It is concluded that the use of artificial intelligence in the textile industry, in particular in management, will serve as a jerk to the innovative development of the industry.

Аннотация. В статье авторами проведен теоретический анализ практического применения искусственного интеллекта в различных сферах.

Сделан вывод о том, что применение искусственного интеллекта в текстильной отрасли, в частности в управлении, послужит рывком к инновационному развитию отрасли.

Keywords: artificial intelligence, genetic algorithms, textile industry, neural networks, production organization, fuzzy logic.

Ключевые слова: искусственный интеллект, генетические алгоритмы, текстильная отрасль, нейронные сети, организация производства, нечеткая логика.

Introduction

Today it is already difficult to imagine a field of activity in which various smart devices that simplify our work or take on part of our duties have penetrated. Among such spheres are medicine, education, business, science, entertainment, fighting crime, solving numerous everyday issues. Most likely, in the future such developments will become even more, and they will certainly be used

everywhere. Thus, in the near future the use of artificial intelligence will qualitatively transform almost all spheres of our life.

Such a wide use of artificial intelligence is due to two major factors. On the one hand, it is able to automate even those processes that previously required human participation: for example, the management of robotic mechanisms in production (that is, in this case, artificial intelligence takes on our responsibilities). On the other hand, it can quickly process and analyze truly gigantic volumes of information and calculate options using a variety of variables. And in this direction, artificial intelligence gives qualitatively better results than humans. Add to this the fact that the machine is not subject to the human factor, and its performance does not depend on emotions and personal problems. As a result, the areas of application of artificial intelligence are very wide and are actually limited only by our imagination and speed of introduction of technological innovations.

Literature review

Problems of using a neuro-fuzzy model for a new hybrid integrated in production was founded at researchers of scientists as Barsky A. B. [1], Beale, H., Demuth H. B. [2], Castellano G., Farnell A. M. [3], Doronin V. Yu., Volshchukov Yu. N., Makashov P. L., Romanenko A. V., Ishmetev E. N., Lednov A. V., Makashova V. N. [4], El-Shafie A., Taha M. R. [5], Eremenko Y. I. [6], Tsukanov M. A., Solovyev A. Yu., Gladkov L. A., Kureichik V. V., Kureichik V. M. [7], Gen M., Tsujimura Y., Ida K. [8], Ljuger J. F. [9], Lohani, A., Goel, N. [1], Tanaka H., Guo P., Zimmermann H. J. [11], Yan-Fei Lan [12], Yan-Kui Liu, Gao-Ji Sun, Ying L. C. [13], Zadeh L. A. [14], Zheng, F., Zhong S. [15] and others. At present, the development and implementation of expert systems have emerged as an independent engineering area. The most interesting problems are modelling the reasoning based on procedural dynamic constraints.

The concept of artificial intelligence

First of all, we would like to highlight a common pool of technologies, united under the general term “artificial intelligence systems”. To him with varying degrees of reliability can be attributed:

– Neural networks;

– Genetic algorithms.

Probabilistic programming methods, etc. It is possible that someone will seem to be “completely piled up” with completely different technologies. But this impression is deceptive, because despite obvious differences, they all have similarities:

– Assume the training of the system;

– The basis of the knowledge base is the collection of samples within the framework of the classifying characteristics;

– Suppose there are redundant computational calculations before one of the streams reaches a certain confidence threshold;

– The result of the calculation is usually any precedent from a pre-established list.

The very same training is characterized by the following main features:

– Presence of a priori knowledge, given in the form of classifying models;

– Presence of a sample database for building a “world model” according to the classification criteria.

Neural networks — neural networks “are a system of connected and interacting simple processors (artificial neurons)”. Handsomely. There are various implementation options such as

Bayesian networks, recurrent networks, etc. The basic model of work: the base image-transfer function-optimizer.

The most widespread today were the limited machines of Boltzmann in a multilayered version. Multilayered, i.e. depth is needed to overcome the problem of "XOR". In addition, as shown by Hinton, the increase in the number of layers of hidden neurons makes it possible to increase the accuracy due to the presence of "intermediate" images with minimal difference in each layer. In this case, the closer the intermediate layer to the output, the more specific the image is.

On the other hand, neural networks are a very powerful and flexible forecasting mechanism. When determining what you need to predict, you need to specify variables that are analyzed and predicted. Here the required level of detail is very important. The level of detail is influenced by many factors: the availability and accuracy of data, the cost of analysis and user preferences of forecasting results. In situations where the best set of variables is unclear, you can try different alternatives and choose one of the options that give the best results. Usually this is the choice in the development of predictive systems based on the analysis of historical data.

The main goal of creating neural networks and the resulting learning task is to get rid of the need for intermediate computation-conclusions when analyzing the profile-matrix of incoming signals. This goal is achieved by creating a database of reference profiles, each of which must correspond to a single neuron — the cell of the resulting matrix. Each neuron is assigned a certain interpretation-result.

"The genetic algorithm is a heuristic search algorithm used to solve optimization and modelling problems by random selection, combination and variation of the desired parameters using mechanisms similar to natural selection in nature".

The inclusion of probabilistic programming methods in this article is more a tribute to fashion, rather than a necessity. By themselves, stochastic methods, which today are proudly called probabilistic programming methods have been known for a long time and, like neural networks, are experiencing another takeoff. A good example of a stochastic approach is genetic algorithms.

The most precise definition of what is meant by probabilistic programming is found here: "a compact, composite way of representing generating probabilistic models and conducting statistical inference in them taking into account the data with the help of generalized algorithms". It is not something fundamentally new, but it is an interesting addition to the methods of machine learning.

Thus, today the term "artificial intelligence" is more simply a subset of technological (algorithmic) approaches to combinatorial problems. The main tasks of which are the reliable separation of "statistically significant" regularities and the construction on the basis of the statistics of object images, without the analysis of cause-effect relationships. The main directions are pattern recognition. Under images one can understand images, sounds, a combination of symptoms of diseases, etc.

The result of learning the neural network or the work of the genetic algorithm should be some detected regularity, represented in the form of a certain matrix (vector). Of course, this matrix or set can be constantly adjusted due to new examples, but this does not affect the essence of what is happening. In any case, the set identified and cleaned from noise can be represented in the form of "alienable logic", which is an "optimal" way of solving the problem. An example of such a field can be the task of automatic text classification, but not the point of view of the separation of texts from already known headings, and actually the creation of headings. Their annotation, as well as the automatic construction of various kinds of ontologies.

Features of artificial intelligence usage

Of course, many features of the application of artificial intelligence depend on the specific projects, developments and tasks that confront smart devices. But we can also highlight several aspects that relate to virtually any sphere of artificial intelligence use.

First of all, these are mistakes. Of course, one cannot say that artificial intelligence is never wrong and external factors are not capable of affecting its actions (including accidents or, for example, hacker attacks). Therefore, it can be assumed that even when smart cars are much stronger in our lives, people will still participate in making important decisions. Most likely, this thesis will be relevant for any sphere of artificial intelligence, where anything serious is at stake.

Now, this approach can be illustrated by the example of a supercomputer-diagnostician IBM Watson. Statistics show that artificial intelligence, in which millions of medical documents and case histories are downloaded, often makes diagnoses more accurate than people. Nevertheless, while the last word remains for the attending physician, and the supercomputer acts as an assistant, an effective and useful tool.

Artificial intelligence used areas

Despite the comparative youth of these technologies, artificial intelligence has already found wide application in various fields, and many projects that come to us from fantastic books become quite real. Here are some interesting examples of the application of artificial intelligence, which are implemented at the moment or are planned for implementation in the near future.

In medicine, it is especially appreciated the excellent memory of artificial intelligence and its ability to process a large amount of data, to compare and analyze information. This is how the already mentioned IBM Watson or, for example, Deep Mind Health from Google works. These and similar smart assistants not only give advice to doctors, but also determine predisposition to diseases or identify them at very early stages, when they can hide from the human eye.

At the end of 2017, Prime Minister Dmitry Medvedev outlined a strategy that, among other things, implies the use of artificial intelligence in Russian healthcare. For example, it is planned to develop a decision support system for the doctor “The Third Opinion”. Now she is able to analyze pictures of blood cells and the fundus, ultrasound of the bladder and lung radiographs, and in the future will learn to process computer tomography and MRI. Another similar Russian system is Botkin A. I. Among its tasks — the analysis of diagnostic data, tips and advice to doctors, monitoring of ongoing treatment. While Botkin A. I. is helping oncologists, it is planned that soon it will work in other areas.

Project Face2Gene from the company FDNA promises to determine the genetic diseases of the photo. According to the developers, about 3,500 genetic diseases can be detected on the facial features, even if they have not yet shown themselves by symptoms. The application is available for smartphones on Android and iOS. Artificial intelligence helps not only doctors, but also patients. In recent years, the popularity of telemedicine and related applications is growing. They use different algorithms: some collect data from wearable sensors like fitness bracelets; Others, rather, are questionnaires, the purpose of which is to establish the exact symptoms and problems of patients. Some AIs recognize the speech, and they can be answered orally, others prefer written communication. Having received the necessary information, the applications either give recommendations on what to do next and how to be treated, or they send relevant information to the treating doctor. Some of the most famous intellectual assistance of this kind are Ada and Your.MD (available on Google Play and the App Store).

In the industry, artificial intelligence allows you to make work more and more automated, up to the point that human participation practically ceases to be required. In particular, LG plans in 2023 to open a factory where all processes — from the purchase of consumables to the control of the products and their shipment — will be carried out with the help of artificial intelligence. Also, the AI will monitor equipment wear, the performance of the delivered plans and other factors that are usually monitored by the person. According to the company's plans, a partial transfer of production from old factories to a new one will begin already in 2021. Perhaps, even then the first information will appear, how successfully the smart plant functions.

As for agriculture, here artificial intelligence is used to control the condition of plants, the level of humidity, the presence in the soil of the necessary nutrients and, in principle, for proper care of planting. For example, robots have learned to identify weeds and gently get rid of them (pulling or processing chemicals). Smart assistants are able to identify plant diseases or pests attacking them from photos, as well as point-wise deliver the necessary drugs. This helps to save pesticides and herbicides more economically. In many countries, the ability of artificial intelligence to process huge amounts of data is used to alleviate the problem of traffic jams. As a result, the intelligent system monitors the roads in real time, builds forecasts, how the situation will develop, and in accordance with this, switches traffic lights. Artificial intelligence, monitoring the traffic, not only watches the crashes, but also helps drivers. For example, can evacuate. Similar systems work in many cities of Europe, Asia, North America, for which the problem of traffic congestion is actual. Of course, it is not possible to completely get rid of traffic congestion in most cases, however, AI can improve the situation with traffic, sometimes — significantly accelerate traffic. Perhaps the progress will be more noticeable, when in a wide use will include autonomous cars - another area of application of artificial intelligence.

A typical example of the use of artificial intelligence in everyday life will be a system of smart houses, which are becoming increasingly common. The task of most such developments is to automate and simplify our everyday life as much as possible. For example, in the morning the AI will be able to move the curtains so that sunlight penetrates into the bedroom, wake you up with radio and turn on the coffee machine, so that you will already have fragrant coffee for breakfast, and when you go to work, it activates the alarm. In the future, the functionality of such systems will certainly be significantly expanded, up to the fact that the refrigerator itself will order your favourite food, and the closet - will strip off clothes.

Smart house optimizes energy consumption, heating and ventilation, controls the operation of various devices, adjusting to your schedule. Together, this not only makes life more convenient, but also helps to save energy more economically.

Another example of the household use of artificial intelligence is automatic translators. If earlier the quality of the text passed through them left much to be desired, but now the situation is changing. Algorithms learn to select the correct translation depending on the context and coordinate parts of the sentence among themselves. As a result, instead of “machine translation” you can get a completely readable text. The introduction of artificial intelligence into his translator in the fall of 2017 announced “Yandex”. The algorithm does not break the text into separate words, but perceives the whole sentence, which allows you to obtain a text of higher quality.

Conclusions

Observing current trends, a disappointing conclusion arises: everything moves in a circle. The philosophers of ancient Greece did not know mathematics and mathematical formulas, they operated on concepts at the level of images and “everyday” concepts. This was not enough to

organize more complex and, most importantly, abstract reasoning. In addition, one of the main tasks of mathematics is the search for logic, which makes it possible to significantly reduce the cost of calculations by deriving compact and optimal regularities. All this served as an impetus for the creation of today's mathematics with its modern notations. The beginning is visible not earlier than the 16th century by a number of scientists such as Descartes, Leibniz, etc. Modern reasoning and the logic of what is called "artificial intelligence" today go the same way. And today's state "leads" back to the sources, because it is based more on the same principles of searching for "common" patterns rather in the style of Pythagoras and Euclid. The application of the logic of artificial intelligence is limited to areas that from the human point of view could be called areas of unconditional reactions. The application of artificial intelligence methods and algorithms extends the capabilities of planning systems in the context of the formalization of expert rules that allow taking into account the specifics of technology and production processes. Artificial intelligence will significantly improve the operational planning system, thereby reducing the time to obtain optimal or acceptable production schedules. If there are random events affecting the production process, it will allow you to react quickly to changes and corrections in the original data. It is also possible to combine methods and algorithms of artificial planning in the implementation of planning functions in production management systems in textile enterprises. You can also use it to predict the demand for textiles through neural networks. But there are some disadvantages, which include the following: long learning time, the problem of retraining, the difficulty of determining the position of the training sample and meaningful inputs.

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