

Blockchain Technology Changing Traditional Methods of Applied Research in Bioinformatics

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ABSTRACT

It is evident that traditional research methods are going to change. The research should be based on the possibility of quick access to information, interactivity and interaction of participants in search for information, elimination of temporal and spatial obstacles. Everything mentioned above requires the use of new research technologies, including blockchain technology. This technology allows solving the problems of collection and systematization of scientific data, access to it within the framework of project operation and implementation at any organization, and joint efforts of various structures. Data saved in blocks and stored on different servers can be accessed by different users. It reduces the cost of coordinating the actions of different users who want to obtain certain information. This article explores how blockchain technology is changing traditional methods of applied research in bioinformatics.

KEYWORDS

Consortium Blockchain, Decentralized Data System, Genetic Information, Genome, Private Blockchain, Public Blockchain

INTRODUCTION

Modern society's development is connected with the use of digital technologies in all spheres. Digital technology as a system of methods and techniques are focused on receipt, storage, processing, use and dissemination of information with the help of computers. Performance and versatility of this schema have made IT popular. The development of research methods based on digitalization in the field related to solving problems of improving the level and quality of human life is particularly relevant. Bioinformatics in this sense is one of the most promising areas of digital technology.

Bioinformatics (computational biology), which appeared at the intersection of molecular biology, genetics, mathematics and computer technologies, studies the sequences of nucleic acids in DNA/RNA or amino acids in proteins, their evolution, construction patterns, the relationship between the sequence of elements and the spatial structure of macromolecules, its physical properties and functions (T. Attwood, Parry D. Smith, 1999; A. Lesk, 2008). Bioinformatics as a synthesis of different sciences allows forming a new level of understanding biological processes occurring in cells and organisms. Various methods of applied mathematics, statistics and other exact sciences are used in bioinformatics.

One of the tasks of bioinformatics is processing a huge array of different biological data, identifying patterns that cannot always be seen in a conventional experiment, predicting the functions of genes and proteins encoded in them, building a model of gene interaction in the cell, drug

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designing. Using blockchain technology that can complement traditional methods of bioinformatics is of particular interest here.

Despite the fact that blockchain technology is quite new, there are a number of scientific works that reveal the essence of this technology, its advantages and disadvantages (R. Redien-Collo 2019; D. Teles & I. Azevedo 2019), as well as the possibility of its application in various spheres of life (S. A. Matthew & Md A. Quadri, 2019; I. I. Benna 2019). Blockchain has become particularly relevant in the financial sphere. Recently, however, it has become clear that blockchain technology can optimize the current and future delivery of health care, education and management services around the world (I. I. Benna 2019).

BACKGROUND

Blockchain technology was proposed in 2008 by Satoshi Nakamoto. This technology was the basis of the first cryptocurrency, Bitcoin. The blockchain can be defined as a distributed decentralized database that continues to register data records confirmed by the respective nodes. All data is stored in a public ledger, which includes all registered transactions. The blockchain consists of a linked sequence of blocks containing transactions with timestamps that are protected by cryptography. Blockchain technology allows recording transactions continuously keeping them unchanged while providing constant updates. Accordingly, the blockchain is provided partly by the database, partly by the development platform and partly by the virtual network intermediary.

The main characteristics of any blockchain are:

- decentralized structure of data storage;
- the highest level of data storage security;
- distributed data storage;
- maximum system transparency for users;
- inability to falsify once recorded data.

MAIN FOCUS OF THE ARTICLE

The Advantages of Using the Blockchain

When we make any transactions in our life, for example, buy an apartment, sell a car or transfer money, information about them is stored in the databases of various companies or government agencies. But in case of an unauthorized access or a server failure information can be stolen or lost. However, in case of using blockchain technology such negative consequences cannot happen, information about transactions is stored not in one place, but simultaneously on thousands of different computers. In addition, when forming a block of transactions, two keys are created in the system, one of them is a fully public key, which is used only to check the basic information on the block, and the second key is secret and is known only to the owner of certain transactions. It will not be possible to hack the blockchain by conventional methods. Anyone who tries to do this will face the inability to crack one particular block without changing the others because they are closely linked. To do this, the attacker will need a lot of time and computing resources, but since the system is decentralized, it will immediately track the changes, checking the blockchain with data on other computers.

Transactions (transfer of information, signing a contract, etc.) in everyday life are accompanied by the use of intermediary services with subsequent payments for the use of these services. However, no one can guarantee the absolute reliability of these intermediaries. Blockchain technology allows excluding the intermediary link in the information transfer, which is also an advantage of using this technology.

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