Neurogenetic Tools for Fintech

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Abstract

The main subject of the article is the analysis of the problems of development and implementation of Fintech technologies in the context of ideology and innovation DeFi (Decentralized Finance), which are caused by accelerating digital economy growth under the influence of blockchain technologies. (AI), incl. neurogenetic instruments. The specifics of the retrospective of the epochs of industrial evolution are described together with the stages of development of financial technologies based on the development of the so-called Fintech for Sustainable Development (FT4SD) drivers. The instrumental basis of FT4SD in the form of a triad of blockchain, AI and IoT, which create a synergetic effect of "decentralized finance", generating, in fact, unlimited investment resources for technological innovation of the digital economy within the processes of sustainable development. The representation of FT4SD drivers in the form of a double helix symbolizes the introduction of neurogenetic tools for the implementation of blockchain and IoT. In the presence of a crisis economic situation in the world in general and in Ukraine in particular, a positive result of supporting "decentralized finance" is shown, which with the use of neurogenetic tools for Fintech are able to ensure optimal decision-making and stable growth of the digital economy.

Keywords 1

neurogenetics, neuro-models, fintech, sustainable development, investment resources, decentralized finance, blockchain, AI, IoT.

1. Introduction

The impact of scientific-technical progress on the development of the modern economy today confirms that in the process of growing climate, environmental and social challenges, the requirements of reliability and stability of global, regional and national financial systems in the long run can be met only by harmonizing them with sustainable development [2]. The financial system consists of institutional units and markets that work together to mobilize financial resources for investment and provide them not so much to finance business as to reorient to new Fintech sectors. The role of financial institutions within such a system is mainly an intermediate link between those who provide funds and those who need them, which usually entails the need to transform and manage the risks of the entire socio-economic system and, above all, its human capital. and innovative resources.

The formation of the category of "green finance", the growth of the renewable energy share and the relevant financial infrastructure requires the search for new approaches and new tools for financial decision-making. And such tools have appeared only recently, but have already attracted the attention and commitment of many experts and analysts. These tools are neuromodels and genetic algorithms

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that are an important part of the theory of artificial intelligence and are increasingly being implemented in the practice of financial analysis, forecasting and decision making.

The role of international financial institutions and banking institutions in modern conditions has changed. Although they are active players in risk assessment, obtaining loans and confirming the issuance of shares and debts, it is necessary to note the formation and spread of a new financial sector, which forms the modern digital economy, legalized as virtual assets and is a crypto-economy (Fig. 1-2). Fig. 1 shows the number of cryptocurrencies (10283), cryptocurrency exchange (383) and the dominance of BTC together with ETH (over 60%) in the upper row of the coinmarketcap.com window show overactive positive dynamics. For comparison, Fig. 2 shows in 2013, the beginning of June – only 14 cryptocurrencies, 2015, the beginning of June – already 651 cryptocurrencies.

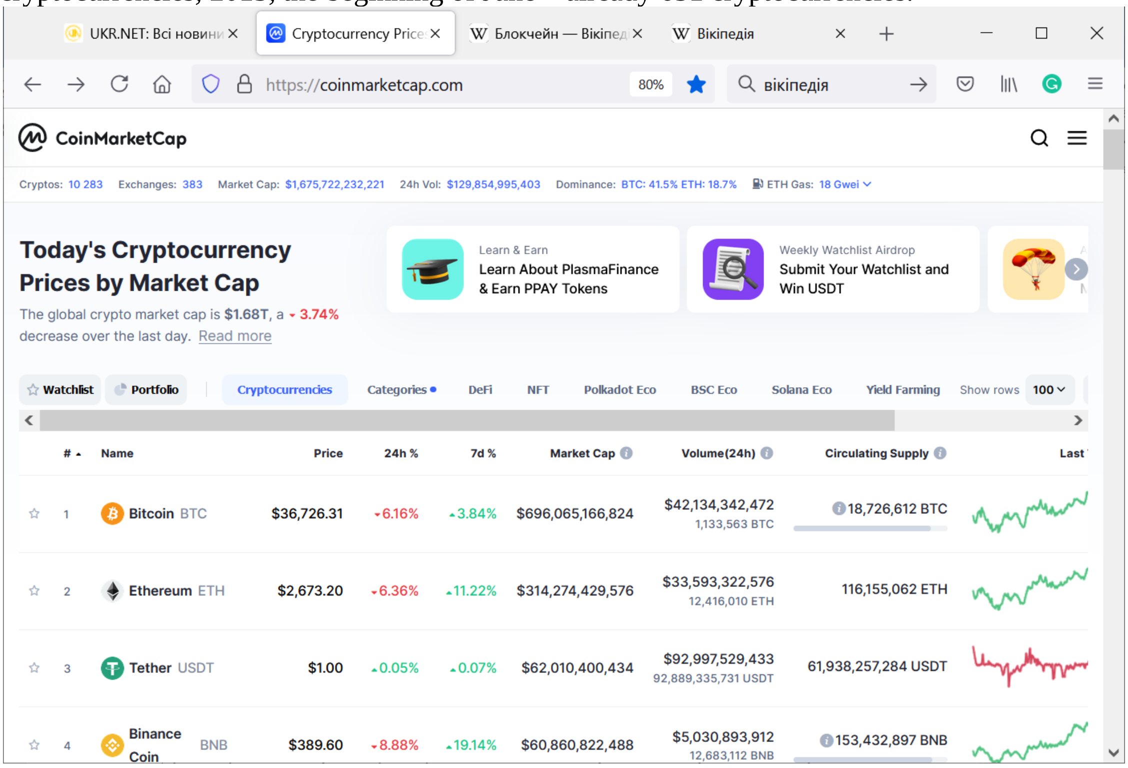

Figure 1: Growth of crypto-economy [14]

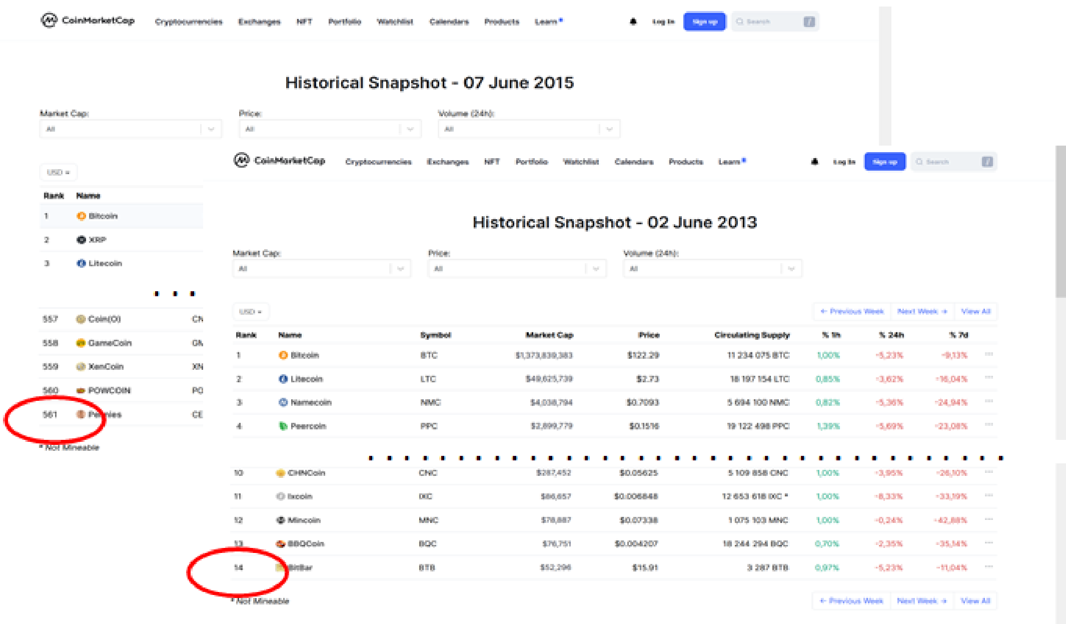

Figure 2: Comparative data on the growth of the crypto market for 2013 and 2015 [2015]

In this context, short- and medium-term banking instruments no longer ensure the preservation and mobilization of long-term assets for investors. Therefore, capital markets increasingly being transformed from slow banking platforms on the Internet of instant Fintech transformations for digital finance. The Bitcoin project, which has been predicted to collapse for more than 10 years in a row, is confidently gaining momentum. And it is no coincidence that the same publication of Satoshi Nakamoto, from which the crypto-economy began, literally meant – “bitcoin as an electronic peer-to-peer cash system” [12]. The affinity of network concepts for neuroscience and crypto-economy, the common basis of cryptology and the blockchain as a distributed database of Internet registers create a single platform for neural networks and genetic algorithms as decision-making tools in digital finance.

2. Related work

Statistics and dynamics of the modern financial space show steady growth, where Fintech instruments work to mobilize sources of long-term investment and as a means of transferring monetary policy to the real economy, which also depends on the efficient operation of the traditional financial system, i.e. banks, capital markets and institutional capital distribution systems. Today, Fintech represents the sector of technology startups, which replace traditional financial market participants with their products, in most cases – banking and insurance institutions, by offering a wide range of consumers alternative solutions without the participation of such intermediaries and in parallel with reducing transaction costs. In this context, we can distinguish 4 epochs of development of Fintech industry from 1.0 to 3.5, which cover a long period of financial development of more than 150 years and according to the authors [1] represent Fintech from the primary telegraph to modern digital and virtual financial technologies (Fig. 3). The use of neuromodel tools and genetic algorithms [19-22] for Fintech decision-making is also widespread.

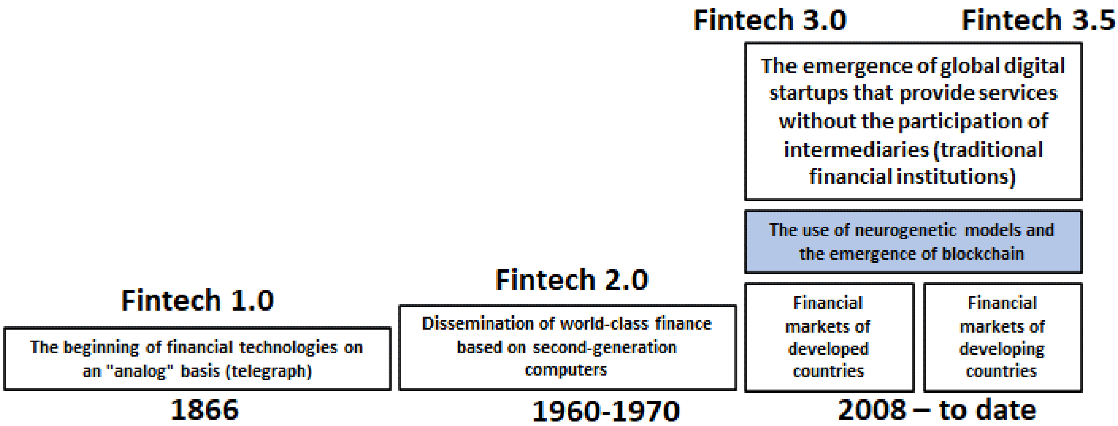

Figure 3: General chronology of Fintech development

In the last period of Fintech 3.0-3.5, which corresponds to the activation and spread of crypto-economy, the aggressive promotion of neurogenetic tools in the practice of supporting Fintech solutions has just begun. At the last stage Fintech 3.0-3.5 begins the stages of intensive research and practical implementation of neurogenetic tools in crypto-economics. Figure 3 highlights the epochs of Fintech 3.0 and 3.5 for countries with financial markets at different stages of development. Moreover, sometimes emerging financial markets are significantly ahead of traditional markets of developed countries in the implementation of Fintech innovations [16]. In these conditions, the Central Banks of developed countries have to catch up and adapt to changing conditions and the latest financial products. This situation is typical today, for example, of the crypto market and blockchain technologies, when central regulators (central banks) plan to introduce national cryptocurrencies, where neurogenetic methods are a significant instrumental support.

Analysis of the publications of leading financial scientists and experts in the field of digitalization [4-6, 11, 13, 17] The world community today is at the stage of the fourth or even the beginning of the fifth industrial revolution, which began in the XXI century due to the widespread use of achievements in the field digital and information technologies, which originated during the previous revolution, namely – the Internet, 3D printing, bio- and nanotechnology. And the achievements of artificial intelligence, neurogenetics and genetic engineering have played a leading role in the introduction for the development of the economy and the production of such previously unknown technologies as blockchain (Table 1) in the field of IT and electronic payment systems.

Table 1
Generalized characteristics of world industrial revolutions

Industrial Revolution, period (years, approx.)	Key technological achievements	The main sources of energy	Description
The first (1760-1900)	Steam engine	Coal	Steam and hydropower are used for mechanization of production
The second (1900-1970) "Technological revolution"	Internal combustion engine	Oil, electricity	Mass production is made possible by the use of electricity
The Third (1970-2000) "Digital Revolution"	Internet, IoT, computers and robots, 3D printing, genetic engineering, artificial intelligence, data analysis, virtual and mixed reality	Atomic energy, natural gas	Production automation is carried out with the help of electronics and information technology
Fourth (2000-…) "Industry 4.0"	*Fintech (green finance), IoT globalization, blockchain*, industrial nano-, biotechnology, neurogenetics, genetic engineering and 3D printing	Green energy	Almost all production is automated, *it begins to use artificial intelligence* and data analysis, human intervention is completely or almost absent; information is stored on the *blockchain*
Fifth (... ? ...)	*Industrial IoT, collaborative work ("cobots")*, industrial neurogenetics		Personalized products are manufactured in accordance with the requirements and needs of consumers; collaborative work and globalization of crypto-economy are widely used

In the last two periods of the industrial revolution, which continue today, the connection between financial technology and sustainable development in a new area, which is commonly called "Fintech for Sustainable Development" (FT4SD). Highlighted in italics in table 1, the tools of neurogenetics is becoming the dominant component of innovative technologies IoT, robotics and Fintech [18].

3. Methods and Materials

It should be stressed that even in the publications and developments of the 3rd period of the industrial revolution [3] laid the scientific foundations of Fintech concepts through the definition of three types of costs in the economy: search costs, coordination and contracting, which assumes that business whether the firm expands until the cost of the transaction within the firm exceeds the cost of the transaction outside it. This statement mainly concerns information-related costs and the assumption that Fintech can destroy redundant or simplify many functions of the financial system and the real economy, significantly reducing the cost of search, coordination and through reducing transaction costs. In subsequent publications in Nature, in January 2013, scientists demonstrated the ability of DNA to encode information to store digital data [10]. The use of the DNA double helix analogy to describe the main attributes of the FT4SD process is becoming a trend in many scientific publications, as the idea of coding, processing and storing information on the basis of genetic engineering in Fintech is spread and fixed theoretically, mathematically and instrumentally [3]. The neurogenetic concept acquires for Fintech a dominant status as an integration of neural network ideologies, genetic algorithms and the blockchain platform as a technological basis for the entire crypto-economy.

Active research on neurogenetic instruments began in the middle of the last century. Hidalgo's research [7] examines the relationship between information and knowledge, their development, dissemination, use and implementation, and how this determines the complexity of the economy around the world and, consequently, their ability to develop over time. The author notes that most DNA molecules consist of two helix strands that form a double helix, and consist of simpler units, the so-called bases, which are combined, in turn, in predetermined ways of gene generation and encode all life forms on land. In this context, the terms "DNA molecules", "bases" and "genes" are used conventionally to denote the components of the DNA helix and the possibility of their integration and interaction. Under the possibilities of integration and interaction of DNA elements, we understand the use of tools of neurogenetic models and methods. Awareness of the fundamental attributes (or basics of DNA) of Fintech and sustainable development as factors of destruction and influence, the use of the language "double helix FT4SD" is proposed (Fig. 4). These two concepts can also be "connected" in predefined ways to create new sustainable business models. It helps to explore and influence change and provide a common language to discuss both the positive and negative effects of FT4SD – effectively ensuring the use of metalanguage for communication between the financial, industrial and technological spheres, taking into account the priority and importance of social and humanitarian components. The language platform of both theoretical and practical developments of neurogenetic instruments is the universal language basis – XML and a number of its derived dialects, including languages of knowledge bases, ontologies, etc.

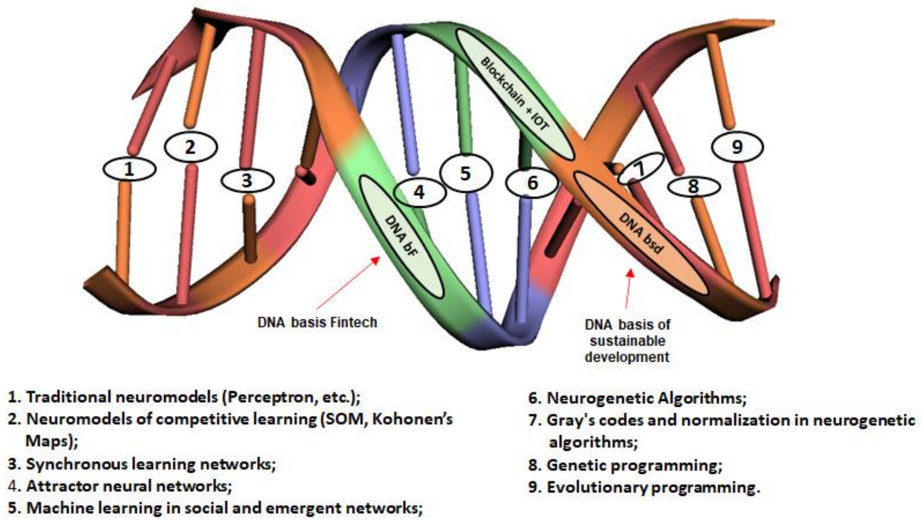

Figure 4: FT4SD double DNA helix in combination with neurogenetic instruments

In Fig. 5 an example of using a neuromodel to forecast the market of communication services (based on the analytical platform Loginom) is given. In the process of adjusting the input parameters, normalization is performed by the method of linear transformation by constructing a scale of values in the interval [0,1]. The normalization algorithms are based on the use of Gray codes.

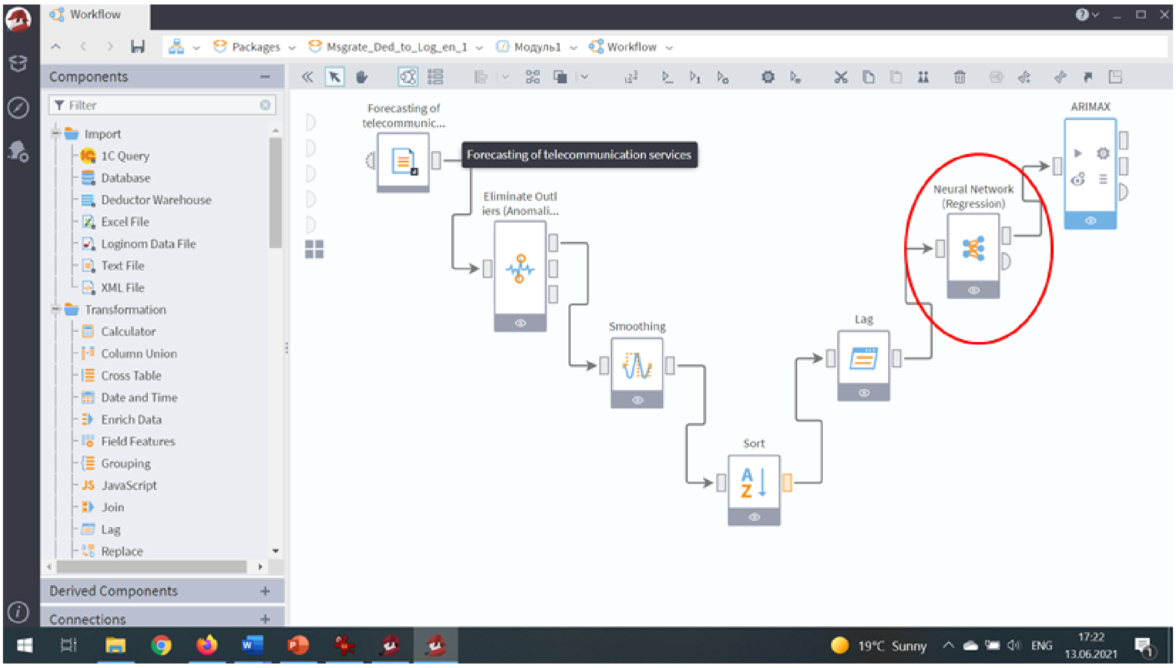

Figure 5: Example of using a traditional neuromodel

Fig. 6 presents the result of calculating forecast data for one of the forecast periods. Before starting the neuromodel, a number of preparatory procedures are performed, which provide preliminary preparation of data for further processing by the neuromodel – a partial processing to eliminate anomalies and other unwanted data deviations, sorting and a sliding window. The last two procedures in the scenario provide the calculation of forecast data – the neural network for one period, and then the ARIMAX procedure – for 2 more periods.

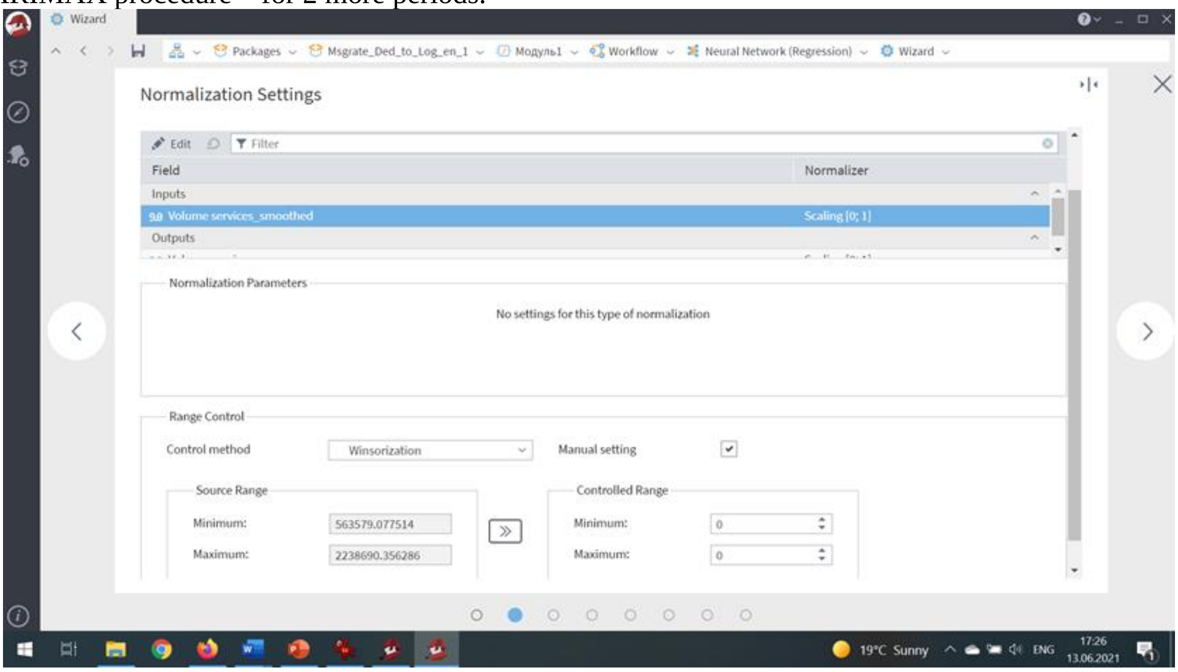

Figure 6: Loginom configuration platform of Loginom analytical platform

Characteristics and learning parameters are set in the following window of setting the neuromodel (Fig. 7): these are the parameters of splitting the input data into training and test sets, determining the methods of splitting, validation and sampling. The main types of partitioning – random (Random) and sequential (Sequence), as validation methods are used – K-fold cross validation and the Monte Carlo method.

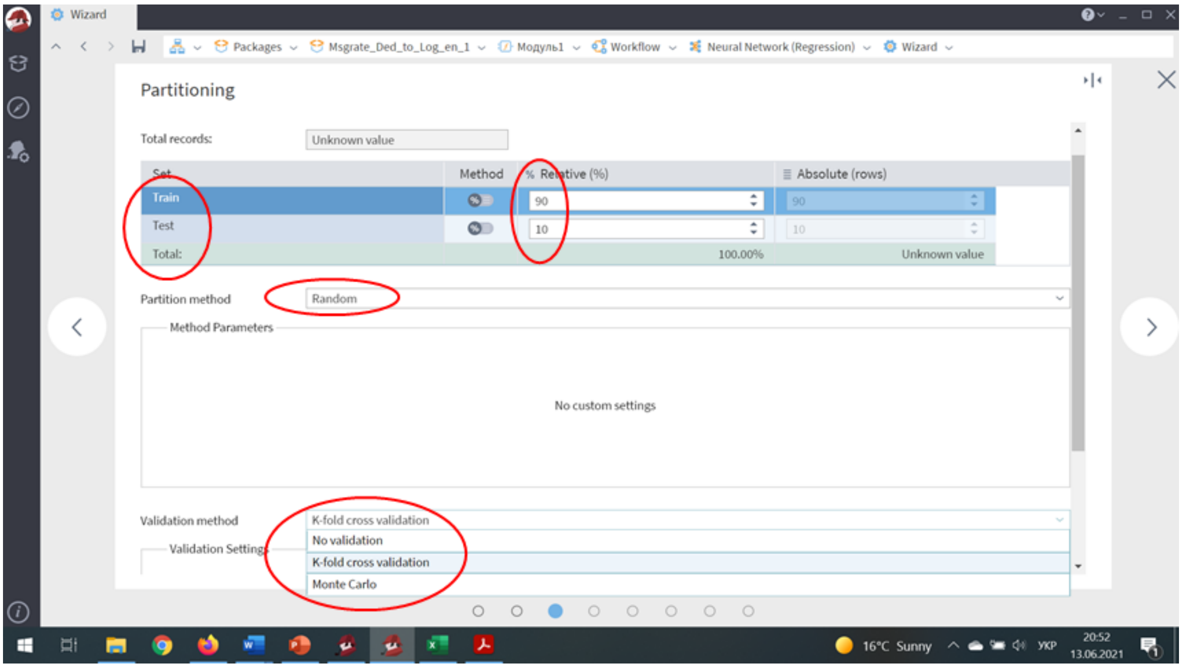

Figure 7: Neural network learning process settings

The next stages of instrumental configuration of the neural network are the definition of the architecture (Fig. 8) and the establishment of parameters for automatic selection of the configuration architecture of the neural network (Fig. 9).

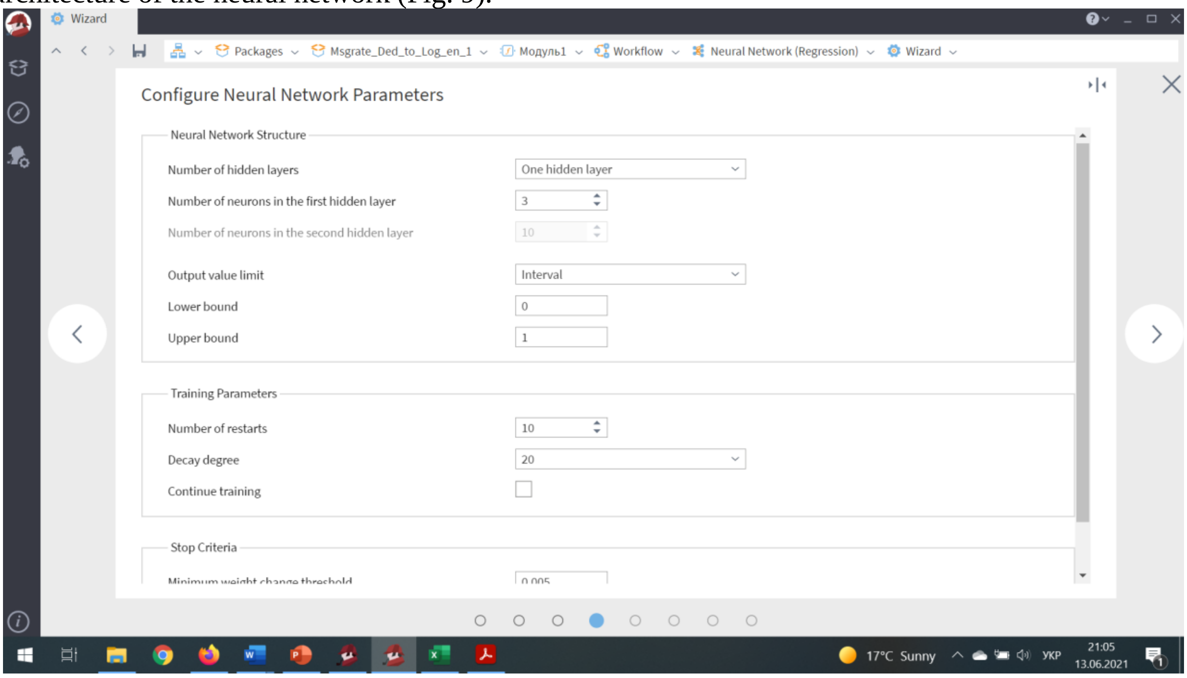

Figure 8: Neural network configuration parameters

Parameters for determining the architecture of the neural network can be considered standard for most software and platforms, they include three main groups: the first – the number of hidden layers and the number of neurons in them, the second – learning parameters (restart, degree of relaxation and continuation) and the third – stop criteria (minimum weight change threshold and maximum number of epochs).

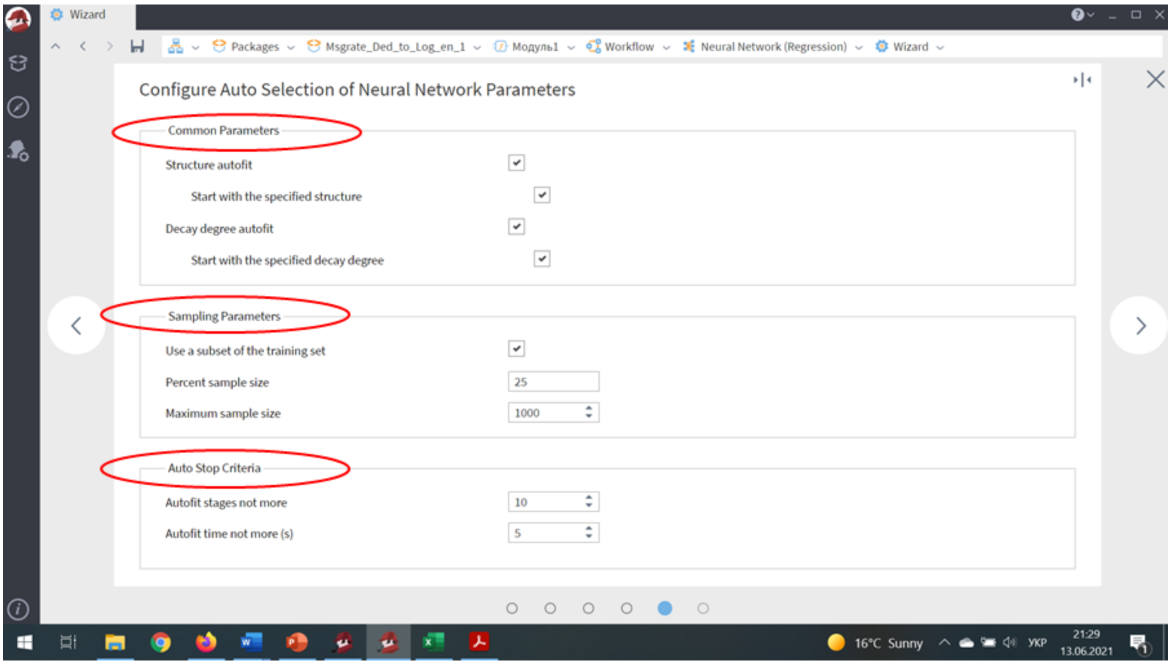

Figure 9: Neural network configuration selection options

Parameterization of automatic neural network configuration selection (Fig. 9) also includes three groups of parameters: the first is a set of standard neural network parameters for automatic structure setting, attenuation and starting parameter of a specific structure, the second is sampling parameters and the third is hitchhiking parameters.

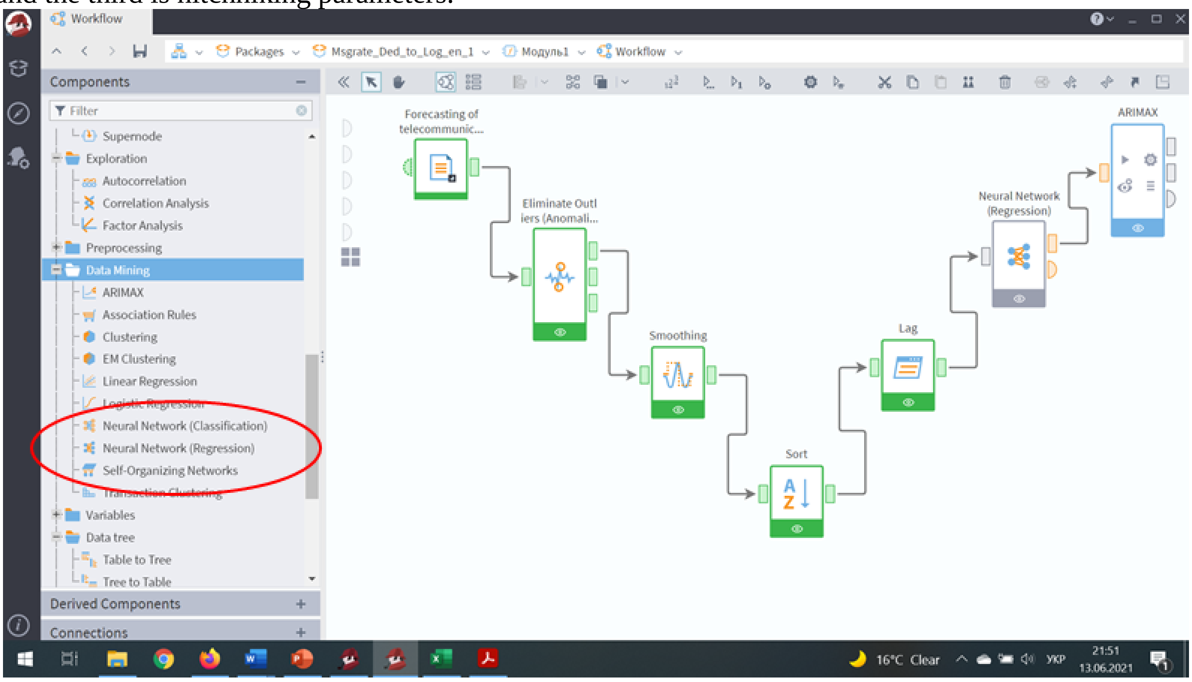

Figure 10: Neural network configuration selection options

Based on the analytical platform Loginom, it is possible to choose three classes of problems with neural networks – classification, regression neural networks and self-organizing maps (SOM, Kohonen maps), within which the process of data preparation and processing, parameterization and direct neural network and neurogenetic calculations obtaining the resulting data. These can be forecast calculations, clustering operations, classification or presentation of multidimensional data in the process of preparation and decision-making.

The concept of Fintech today as a phenomenon, along with the positive attitude of the world community, is also of concern, in particular from representatives of regulatory bodies. The reason for this is not the financial technologies themselves, but the speed of their development and the integrity of the intentions of those who use them. Thus, the era of modern society is marked by a new digital economy, which, according to Professor of Fintech and blockchain D. Kuo Chuen Lee (Singapore), provides for the presence of four "D" [1]:

- Digitalization;
- Disintermediation (reduction of the use of intermediaries);
- Democratization and
- Decentralization.

The combination of these four factors has given society, in addition to innovative forms of doing business (digital nomadism, Digital Nomadism) and everyday digital life (social networks, Social Networks) also a synergistic effect – the fifth industrial revolution is expected to bring back the human factor (Human Touch). in production in a broad sense [13]. According to some forecasts, in the future the industry will again feel the urgent need for human intervention due to the influence of behavioral factors (e.g., the precedent of irrational financial decisions of individuals, groups and communities), because the driver of any change is not new technology, but the person behind them, her personality. While some professions will disappear due to primitive robotization, new ones will appear – those that require a suitably highly skilled workforce [9] with an emphasis on intelligence and decision-making.

4. Conclusion

In the presented study, the basics of DNA of financial technologies and sustainable development (F are connected using so-called "DNA connectors", which are integrated into the "FT4SD reducer" and, if necessary, can be combined using different methods. This combination of "FT4SD reducer" contains three main components - Internet of Things, blockchain and Artificial Intelligence), which are able to provide a large-scale sustainable development program for the modern world community within the crypto-economy.

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