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THE VISUALIZATION OF THE ANALYSIS OF BIG DATA

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*   **Abstract.** The problem of visualization of the results in processing of Big Data is described, the tools and methods of data visualization are presented, the examples of data visualization are shown.*
*   **Keywords:** analysis of Big Data, Big Data, visualization.*

Data visualization is an important function of business analysis and advanced analytics. Visualization of analytical data is used to work with Big Data [1]. This is necessary so that the results of analytics can be estimated more conveniently and used for work.

Visual tools speed up and simplify the process of analyzing information, and also allow you to see the most important information instantly. Most people perceive visual images better than text: 90 % of the information entering the brain is images. The brain processes images 60,000 times faster than text.

Visualization helps to estimate the value of information or data. Data visualization refers to the representation of information in graphical form: graphs, charts, histograms, 3D models, maps and pictograms.

Definition of Big Data. First of all we can say that Big Data is huge amounts of information created by IT giants and large information systems [2]. The sources of big data are, for example, social networks or the Internet of things. Currently, big data sets are measured in petabytes (millions of gigabytes). But size is not the only characteristic. Such data is usually presented in different formats, has no structure, and may contain erroneous information.

For example, the database of personal data of a social network is not Big Data. The size is large, but the information in it is homogeneous and structured, and it is not difficult to analyze it. However, data about clicks on links, likes, touches on the smartphone screen is Big Data. There are a lot of such data that cannot be analyzed by standard methods.

Definition of Data Science. In Data Science, Big Data is processed and analyzed to find patterns in them and use them to improve the efficiency of a company or system. Various tools are used to process the information. Among them there are the following techniques: **data mining** (used to discover previously unknown and useful information that will be useful for decision-making in various spheres); machine learning (the creation of neural networks that are able self-learn, as well as process information efficiently and quickly); classification (used for predicting consumer behavior in a certain market segment); cluster analysis (for classifying objects into groups by identifying their common features); crowdsourcing (used to collect information from a large number of sources); visualization (used to present the results of the analysis in the form of diagrams and animations).
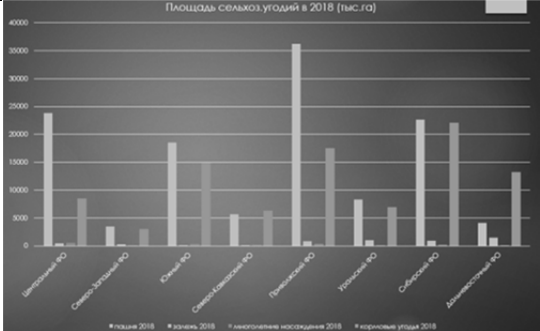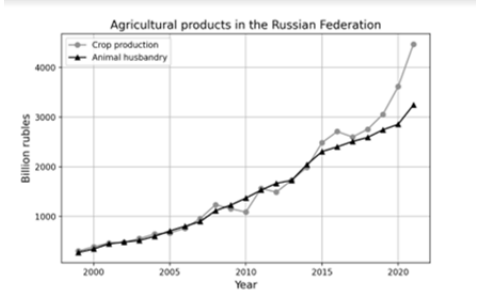
Tools and methods of data visualization. Visualization is the final stage, the demonstration of the results of the analysis [4]. Visualization of analytical data is used wherever people need to work with data in order to estimate the results of processing.

The modern software market provides a variety of data visualization tools, from free Internet services to expensive corporate packages: Excel, Google Sheets, Google Data Studio, RStudio, Tableau, Power BI, QlikView, OWOX BI Smart Data, SAS, Datawrapper, Flourish, Plotly [5].

Visualization methods are diagrams, graphs, maps, 3D models, time scales. The choice of graphical display of data is carried out taking into account the type of data and its purpose.

Table 1 − Data visualization examples

Title	Description	Screenshots (program code, result of visualization)
Area of agricultural land by regions of Russia	The input data: the area of agricultural land by regions of Russia (2015−2018) [3]. The map shows the distribution of agricultural land by regions of Russia in 2018. The map allows you to choose the region of Russia you want and see the information about the area of its agricultural land including pastures, unused land, plowed fields and so on. The histogram shows the distribution of area of agricultural land in different federal districts of Russia.	

	The app – Microsoft Excel	
The cost of agricultural products in Russia	The input data: the cost of agricultural products in Russia by types of animal husbandry and crop production (1999-2021) [3]. The graph shows the dynamics of the cost of agricultural products (animal husbandry and crop production)	

The importance of data visualization. Visualization of the results of big data analysis helps to take control of growing volumes of data, helps to separate important information from non-essential, helps to discover valuable information [2].

Visualization of analytical data should be competent so that any user can read the data. The main thing is not to confuse, but to present the information as simply as possible.

It is impossible to single out one best and universal method of data visualization, since each method is designed for its own purposes, and only a developer of data analysis and visualization systems can independently choose a method suitable for solving its tasks.

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