Chapter 15
Visual Analytics to Build a Machine Learning Model

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ABSTRACT

One of the most interesting and promising areas of development of machine learning is the active involvement of a human in the process of building a model. However, there are problems with the effective integration of humans into a workflow. It is necessary to develop techniques and information technologies that would allow the effective use of human intellectual capabilities, thereby expanding the machine learning tools. This work considers the use of visual analytics with the goal of building a machine learning model by a human and the technique of transferring this model to the machine level. This made it possible to expand the capabilities of machine learning through the active and productive use of human intellectual abilities.

INTRODUCTION

With the development of new technologies and the constant increase in the level of informatization of society, the problem of machine classification is important. The problem of classification can be considered a classic in machine learning. Along with the use of a wide variety of solutions, the search for new approaches remains relevant. Consider an approach based on the use of human intellectual capac-

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ity to build a classification model. That is, to integrate a human into the process of machine learning. This will extend the ability to build models by utilizing human classification capabilities. This creates a hybrid machine learning system that opens up new avenues for improving results. A large amount of information a human receives visually.

The use of machine learning is widely used in modern areas of information technology (Rahaman & Vasant, 2020), (Gholamy, 2019), (Vasant, 2019), (Ganesan, 2020), (Islam, 2020). Research into the use of artificial intelligence in work technology is being actively developed (Rahim, 2020).

Data visualization is a task that any researcher faces in his work. The problem of data visualization is reduced to the problem of visualizing experimental data or the results of a theoretical study. Traditional tools in this area - graphs and charts cope with the task of visualization when it becomes necessary to display interrelated quantities. Visual display of data is much more informative than other methods of obtaining and perceiving information, more convenient and easier to perceive and understand than, for example, displaying data in tables, diagrams, mathematical matrices, or simply in numbers. Nowadays, tools are being distributed for the visual display of information, data, and for this purpose information technology is widely used, so there is a need to create software for data visualization. New varieties of visual presentation of data have also appeared, some of which come from graphs, charts, histograms and not just visualization on a plane, but visualization in 3D space.

Data visualization - is a visual display of large arrays of numerical and other information, which is made possible through the use of computer graphics. Software systems for data visualization can be easily integrated into information systems. The problem of data visualization is reduced to the problem of visualizing experimental data or the results of a theoretical study.

Information visualization is an interactive study of the visual display of abstract data to enhance human cognition. Abstract data includes both numeric and non-numeric, such as text and geographic information.

INFORMATION VISUALIZATION

The field of information visualization has arisen as a result of studies of human-computer interaction, computer science, graphics, design, psychology and business methods. It is increasingly being used as the most important component in scientific research, digital libraries, data mining, financial data analysis, market research, industrial control. Visualization of information implies that visual representations and methods of interaction take advantage of the ability of the human eye to transmit information to the brain so that users can see, learn and understand a large amount of information at a time. Information visualization is aimed at creating approaches to the transfer of abstract information into intuitive images (Thomas & Cook, 2005).

One of the main elements of machine learning is model building. One of the directions for improving the work of this model is the use of human intellectual abilities. As an example, “human-in-the-loop” approach of Endert A. (Endert, 2014). This trend was developed by VIS4ML (Sacha, 2018) also Interactive Machine Learning (Lee, 2016), (Holzinger, 2019), (Teso & Kersting, 2019), Interactive Intelligence Systems (Sinitsyn, 2019).

In this area of visual analytics, a human is used to iteratively improve the formal model. However, along with the process of building a formal model for a machine, a person forms a mental model in the mind. The concepts of a formal and mental model are described by Andrienko N. (Andrienko, 2018). Today, a human is used to improve the formal model for a machine. The machine cannot use the mental